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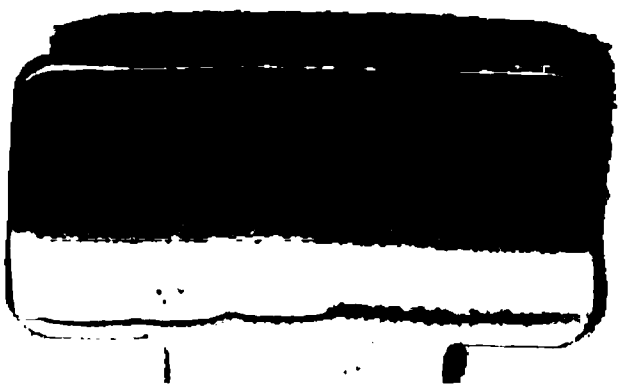

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U. S. DEPARTMENT OF AGRICULTURE.
U.S. BUREAU OF ANIMAL INDUSTRY.

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SPECIAL REPORT

ON

DISEASES OF THE HORSE.

PREPARED UNDER THE DIRECTION OF

DR. D. E. SALMON,

CHIEF OF THE BUREAU OF ANIMAL INDUSTRY.

BY

DRS. MICHENER, LAW, HARBAUGH, TRUMBOWER, LIAUTARD, HOLCOMBE, HUIDEKOPER, AND DICKSON.

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LETTER OF TRANSMITTAL

SIR: I have the honor to submit herewith a report upon diseases of the horse, which has been prepared with great care by a number of the most eminent members of the veterinary profession in the United States. The production of a work of this character is a task of such magnitude that it could not be undertaken by any one man with a prospect of its early completion. It was deemed best, therefore, to divide the subject into sections and to place the preparation of each section in the hands of a veterinarian whose practical experience and reputation would insure a valuable contribution. By adopting this plan the contents of the volume have been made ready for the printer within a year from the time the work was begun. While, on account of this method of preparation, there may not be quite the same uniformity of style and treatment which would be expected in a volume written by a single author, it is hoped that this will not be found objectionable, and the speedy completion and the co-operation of authors who have given special attention to their subjects will prove of great advantage.

The need of a work on the diseases of the horse, which could be distributed to farmers as a safe and scientific guide in the treatment of this species of our domesticated animals, either when affected with slight disorders or serious illness, has long been felt. This obvious want has led to the preparation of the present volume, which is designed as the first of a series to cover the diseases of all varieties of farm animals. The writer would not advise the farmer in ordinary circumstances to dispense with his veterinarian, any more than he would advise him to treat the diseases of his own family, to manufacture his own furniture, or to be his own blacksmith. There are, however, only too many cases in which the veterinarian can not be procured in time for success, if at all; and, consequently, the farmer who knows or has the means of learning the nature of the disease and the proper treatment will be able to save an animal when otherwise he would lose one. It is common for intelligent people to laugh at the idea of attempting to make every man his own doctor, his own veterinarian, or his own carpenter, and in an ideal condition of society no doubt this would be absurd. But under the conditions which actually obtain on our farms, the farmer who can use tools, if but awkwardly, often finds it extremely convenient to temporarilly usurp the functions of the carpenter; and he also finds that in many cases he must treat his ailing animals or allow them to

suffer without treatment. Knowing this to be the case, is it not far better for the stock-owner to have at his command the advice of veterinarians eminent in their profession than for him to follow the absurd, often barbarous methods of treatment which have been handed down by tradition from the empiricism and ignorance of long-past ages?

It is an extremely difficult matter to divest medical literature of technical terms and expressions more or less incomprehensible to the general reader. This has made scientific medicine a sealed book to the masses of our people, and there is no subject of which they are more ignorant. An attempt has been made in this work to present the matter in as simple language as possible, and while some of the authors have been more happy than others in this respect, it is believed that no great difficulty will be met with in any of the articles.

While the subject has been treated in language of a more or less popular style and the book is intended as a guide to the farmer, its intrinsic scientific value should not be entirely lost sight of. In many respects it is a notable contribution to existing knowledge, and it will be prized by the veterinarian not less than by the farmer. No doubt there are some defects in this first edition which the experience of the future will enable us to remedy, but as a whole the book is one which can not fail to be of immense service in educating horse-owners and in hastening the adoption of humane and scientific treatment in the disorders which afflict man's most patient and faithful servant.

The illustrations have been very carefully drawn by Mr. Haines, the greater part of the subjects being selected by Dr. Cooper Curtice. In cases where they have been copied due credit has been given on the plates, but it should be stated here that we are indebted to Dr. John S. Billings, of the Army Medical Museum, for the use of the Auzoux models and a number of specimens of diseased feet from which drawings were made.

Very respectfully,

D. E. SALMON,
Chief of Bureau of Animal Industry.

Hon. J. M. RUSK,
Secretary of Agriculture.

SPECIAL REPORT

ON

DISEASES OF THE HORSE.

METHODS OF ADMINISTERING MEDICINES.

By CH. B. MICHENER, V. S.,

Professor of Cattle Pathology and Obstetrics at the New York College of Veterinary Surgeons, Inspector of the Bureau of Animal Industry, etc.

Medicine may enter the body through any of the following designated channels: First, by the mouth; second, by the lungs and upper air-passages; third, by the skin; fourth, under the skin (hypodermic methods); fifth, by the rectum; and, sixth, by intra-venous injections.

(1) BY THE MOUTH.—Medicines can be given by the mouth in the form of powders, balls, drenches, and electuaries.

Powders.—These should be as finely pulverized as possible, in order to secure a rapid solution and absorbtion. Their action is in this way facilitated and intensified. Powders must be free from any irritant or caustic action upon the mouth. Those that are without any disagreeable taste or smell are readily eaten on the feed or taken in the drinking water. When placed on the feed they should first be dissolved or suspended in water and thus sprinkled on the feed. If mixed dry the horse will often leave the medicine in the bottom of his manger.

Balls.—When properly made these are cylindrical in shape, 2 inches in length and about three-fourths of an inch in diameter. They should be fresh, but, if necessary to keep them some time, they should be made up with glycerine, or some such agent, to prevent them from becoming too hard. Very old, hard balls, are sometimes passed whole with the manure, without being acted upon at all. Paper is to be wrapped around balls when given; it should be thin but firm; toilet paper is the best. Balls are preferred to drenches when the medicine is extremely disagreeable or nauseating; when the dose is not too large; when the

horse is ugly to drench; when the medicine is intended to act slowly. Certain medicines can not, or should not, be made into balls—medicines requiring to be given in large doses, oils, caustic substances, unless diluted and thoroughly mixed with the vehicle, deliquescent or efflorescent salts. Substances suitable for balls can be made up by the addition of honey, sirup, soap, etc., when required for immediate use. Gelatine capsules of different sizes are now obtainable and are a convenient means of giving medicines in ball form.

Drenches are to be given when the medicine is liquid, when the dose is large, and when we desire speedy action.

Electuaries are medicines mixed mostly with licorice-root powder, molasses, or sirup to the consistency of honey, or a "soft-solid." They are intended, chiefly, to act locally upon the mouth and throat. They are given with a wooden paddle or strong long-handled spoon.

When balls are to be given we should observe the following directions: In shape they should be cylindrical, of the size above mentioned, and soft enough to be easily compressed by the fingers. If made round or egg-shaped, if too long or too hard, they are liable to become fixed in the gullet and cause choking. Balls may be given with the "balling-gun" (obtainable at any veterinary instrument maker's) or by the hand. If given by the hand a mouth speculum or gag should be used to prevent the animal from biting the hand or crushing the ball. Always loosen the horse before attempting to give a ball; if tied he may break his halter and injure himself or the one giving the ball. With a little practice it is much easier to give a ball without the mouth-gag, as the horse always fights more or less against having his mouth forced open. The tongue must be firmly grasped with the left hand and gently pulled forward; the ball, slightly moistened, is then to be placed with the tips of the fingers of the right hand as far back into the mouth as possible; as the tongue is loosened it is drawn back into the mouth and carries the ball backward with it. The mouth should be kept closed for a minute or two. We should always have a pail of water at hand to offer the horse after balling. This precaution will often prevent him from coughing out the ball or its becoming lodged in the gullet.

It is, very often, impossible to get balls properly made, or to induce owners or attendants to attempt to give them, and for these reasons medicines by the mouth are mostly given in the form of drenches. When medicine is to be given as a drench we must be careful to use enough water or oil to thoroughly dissolve or dilute it; more than this makes the drench bulky and is unnecessary. Insoluble medicines, if not irritant or corrosive, may be given simply suspended in water; the bottle to be well shaken immediately before giving the drench. The bottle used for drenching purposes should be clean, strong, and smooth about its neck; it should be without shoulders, tapering, and of a size to suit the amount to be given. A horn or tin bottle may be better, in that they are not so easily broken by the teeth. If the dose is a small one

the horse's head may be held up by the left hand, while the medicine is poured into the mouth by the right. The left thumb is to be placed in the angle of the lower jaw, and the fingers spread out in such a manner as to support the lower lip. Should the dose be large, the horse ugly, or the attendant unable to support the head as directed above, the head is then to be held up by running the tines of a long-handled wooden fork under the nose-band of the halter; the halter-strap or a rope may be fastened to the nose-band and thrown over a limb, beam, or through a pulley suspended from the ceiling. Another way of supporting the head is to place a loop in the end of a rope, and introduce this loop into the mouth just behind the upper front teeth or tusks, the free end to be run through a pulley, as before described, and held by an assistant. It is never to be fastened, as the horse might do himself serious injury if made fast. The head is to be elevated just enough to prevent the horse from throwing the liquid out of his mouth. The line of the face should be horizontal, or only the least particle higher. If the head is drawn too high the animal can not swallow with ease, or even with safety. (If this is doubtful, just fill your mouth with water, throw back the head as far as possible, and then try to swallow). The person giving the drench should stand on some object in order to reach the horse's mouth, on a level, or a little above it. The bottle or horn is then to be introduced at the side of the mouth, in front of the molar teeth, in an upward direction. This will cause the horse to open his mouth, when the base of the bottle is to be suddenly elevated, and about 4 ounces of the liquid allowed to escape on the tongue as far back as possible, care being used not to get the neck of the bottle between the back teeth. The bottle is to be immediately removed, and if the horse does not swallow this can be encouraged by rubbing the fingers or neck of the bottle against the roof of the mouth, occasionally removing them. As soon as this is swallowed repeat the operation until he has taken all the drench. If coughing occurs, or if, by any mishap, the bottle should be crushed in the mouth, lower the head immediately.

Do not rub, pinch, or pound the throat, nor draw out the tongue when giving a drench. These in no way aid the horse to swallow and oftener do harm.

Drenches must never be given through the nose; they are liable to strangle the animal, or, if the medicine is irritating, it sets up an inflammation of the nose, fauces, windpipe, and sometimes the lungs. Cattle are easily drenched by simply holding them by the nose with the left hand, while the medicine is poured into the mouth with the right. Balls are not to be given to cattle; they often become imbedded in the great mass of food in the stomach and act tardily or not at all.

(2) Medicines are administered to the lungs and upper air passages by insufflation, inhalation, and nasal douche. *Insufflation* consists of blowing an impalpable powder directly into the nose. It is but rarely resorted to. Gaseous and volatile medicines are given by *inhalation*,

as is also medicated steam or vapor. Of the gases used we may mention, as the chief ones, sulphurous acid gas, and occasionally chlorine. The animal or animals are to be placed in a tight building, where these gases are generated, until the atmosphere is sufficiently impregnated with them. Volatile medicines, as the anæsthetics, (ether, chloroform, etc.), are only to be given by the attending surgeon. Medicated vapors are to be inhaled by placing a bucket containing hot water, vinegar and water, scalded hay or bran, to which carbolic acid, iodine, or other medicines have been added, in the bottom of a long grain bag. The horse's nose is to be inserted into the top of the bag, and he thus inhales the "medicated steam." Care must be taken not to have this hot enough to scald the animal. Scalding bran or hay is often thus inhaled to favor discharges in sore throat or "distemper."

The *nasal douche* is employed by the veterinarian in treating some local diseases of the nasal chambers. Special appliances and professional knowledge are necessary when using liquid medicines by this method. It is not often resorted to, even by veterinary surgeons, since the horse, as a rule, objects very strongly to this mode of medication.

(3) By the Skin.—Medicines are often administered to our hair-covered animals by the skin, yet care must be taken in applying some medicines, as tobacco-water, carbolic acid solutions, etc., over the entire body, as poisoning and death follow in some instances from absorption through the skin. We must also exercise care, and not apply poisonous medicines over very large raw or abraded surfaces, for the same reasons. For domestic animals medicines are only to be applied by the skin for local purposes or diseases, as laudanum, chloroform liniment, etc., for neuralgia.

(4) Under the Skin—Hypodermic Method.—Medicines are frequently given by the hypodermic syringe, under the skin. It will not be safe for any but medical or veterinary practitioners to use this form of medication, since the medicines thus given are powerful poisons. There are many precautions to be observed; a knowledge of anatomy is indispensible.

(5) By the Rectum.—Medicines may be given by the rectum when we can not give or retain them by the mouth; when we want a local action on the last gut; to destroy the small worms infesting the large bowels; to stimulate the peristaltic motion of the intestines and cause evacuation; and to nourish the body. Medicines are here given in the form of suppositories, or as liquid injections—enemas.

Suppositories are conical bodies made up of oil of theobroma and opium (or whatever medicine is indicated in special cases), and are introduced into the rectum or vagina to allay irritation and pain of these parts. They are not much used in veterinary practice.

Enemas, when given for absorption, should be small in quantity, neutral or slightly acid in reaction, and of a temperature of from 90° to 100° F. These, like foods given by the rectum, should only be in-

troduced after the last bowel has been emptied by the hand, or by copious enemas of tepid water. Enemas or clysters are mostly given to aid the action of physics, and should then be in quantities sufficient to distend the bowel and cause the animal to eject them. Simple water, salt and water, or soap and water, in quantities of a gallon or more, may be given every half hour. It is best that the horse retain them for some little time, as the liquid serves to moisten the dung and favor a passage. *Stimulating* enemas (turpentine 2 ounces, in linseed oil 6 ounces), should be administered after those already mentioned have emptied the last bowel, with the purpose of still further increasing the natural worm-like movement of the intestines and aiding the purging medicine.

Liquids may be thrown into the rectum by the means of a large syringe, or different kinds of complicated pumps. A very good "injection pipe" can be made by any tinsmith at a trifling cost, and should be constantly on hand at every stock-farm. It consists of a funnel, about 6 inches deep and 7 inches in diameter, which is to be furnished with a pipe-like prolongation, placed at right angles to it, from 14 to 16 inches in length, and carefully rounded and soldered at the ends. This pipe must be *perfectly smooth*, in order to prevent injury to the rectum. Introduce this pipe to its full extent, after thoroughly oiling it, and pour the liquid into the funnel rapidly. The pressure of the atmosphere will force the liquid into the bowels. For all ordinary purposes this instrument is quite as good as the more complicated and expensive ones.

Ordinary cold water, or even ice-cold water, is highly recommended by many as a *rectal injection* for horses overcome by the excessive heat of summer, and may be given by this simple pipe.

(6) INTRA-VENOUS INJECTIONS.—Injections directly into veins are to be practiced by medical or veterinary practitioners only, as are probably some other means of giving medicines—intra-trachael injections, etc.

DISEASES OF THE DIGESTIVE ORGANS.

By CH. B. MICHENER, V. S.,

Professor of Cattle Pathology and Obstetrics at the New York College of Veterinary Surgeons, Inspector Bureau of Animal Industry, etc.

It will not prove an easy task to write "a plain account of the common diseases, with directions for preventive measures, hygienic care, and the simpler forms of medical treatment" of the digestive organs of the horse. This study includes a careful consideration of the food and drink of our animals, their quality, quantity, analyses, etc. This, of itself, is material for a book. Being limited as to space, one must endeavor to give simply an outline; to state the most important facts, leaving many gaps, and continually checking the disposition to write anything like a full description as to cause, prevention, and modes of treatment of disease.

These articles are addressed entirely to farmers and stock-owners, and I must ask my professional brethren to bear this in mind, when disposed to complain of a want of scientific treatment of the subjects.

Water.—It is generally held, at least in practice, that any water that stock can be induced to drink is sufficiently pure for their use. This practice occasions losses that would startle us if statistics were at hand. Water that is impure from the presence of decomposing organic matter, such as is found in wells and ponds in close proximity to manure heaps and cess-pools, is frequently the cause of diarrhea, dysentery, and many other diseases of stock, while water that is impregnated with different poisons, and contaminated with specific media of contagion, produces death in very many instances.

Considering first the quantity of water required by the horse, it may be stated that when our animals have access to water continually they never drink to excess. Were the horse subjected to ship-voyages, or any other circumstances where he must depend upon his attendant for the supply of water, it may be roughly stated that each horse requires a daily average of about 8 gallons of water. This will vary somewhat upon the character of his food; if upon green food, less water will be needed than when fed upon dry hay and grain.

The time of giving water should be carefully studied. At rest, the horse should receive water at least three times a day; when at work, more frequently. The rule here should be to give in small quantities and often. There is a popular fallacy that if a horse is warm he should not be allowed to drink, many claiming that the first swallow of water "founders" the animal, or produces colic. This is erroneous. No matter how warm a horse may be, it is always entirely safe to allow him from six to ten swallows of water. If this is given on going into the stable, he should be given at once a pound or two of hay and allowed to rest about an hour before feeding. If water be now offered him it will in many cases be refused, or at least he will drink but sparingly. The danger, then, is not in the "first swallow" of water, but is due to the excessive quantity that the animal will take when warm if not restrained.

Water should never be given to horses when it is ice-cold. It may not be necessary to add hot water, but we should be careful in placing water-troughs about our barns to have them in such position that the sun may shine upon the water during the winter mornings. Water, even though it be thus cold, seldom produces serious trouble if the horse has not been deprived for a too great length of time.

In reference to the *purity* of water Smith, in his "Veterinary Hygiene," classes spring, deep-well water, and upland surface-water as *wholesome;* stored rain-water and surface-water from cultivated land as *suspicious;* river water to which sewage gains access and shallow-well water as *dangerous.* The water that is used for drinking purposes for stock so largely throughout some States can not but be impure. I refer to those sections where there is an impervious clay subsoil. It is the custom to scoop or hollow out a large basin in the different pastures. During rains these basins become filled with water. The clay subsoil being almost impervious acts as a jug, and there is no escape for the water except by evaporation. Such water is stagnant, but would be kept comparatively fresh by subsequent rains were it not for the fact that much organic matter is carried into these ponds by surface drainage during each succeeding storm. This organic matter soon undergoes decomposition, and as the result we find diseases of different kinds much more prevalent where this water is drunk than where the water-supply is wholesome. Again, it must not be lost sight of that stagnant surface-water is much more certainly contaminated than is running water by one diseased animal of the herd, thus endangering the remainder.

The chief impurities of water may be classed as *organic* and *inorganic.* The organic impurities are either animal or vegetable substances. The salts of the metals are the inorganic impurities. Lime causes hardness of water, and occasion will be taken to speak of this when describing intestinal concretions. Salts of lead, iron, and copper are also frequently found in water, and will be referred to hereafter.

About the only examination of water that can be made by the average stock-raiser is to observe its taste, color, smell, and clearness. Pure water is clear and is without taste or smell. It should possess a slight bluish tint.

Chemical and microscopic examination will frequently be necessary in order to detect the presence of certain poisons, bacteria, etc., and can of course only be conducted by experts.

Foods and feeding.—In this place one can not attempt anything like a comprehensive discussion of the subject, and I must content myself with merely giving a few facts as to the different kinds of food, preparation, digestibility, proper time of feeding, quality, and quantity. Improper feeding and watering will doubtless account for over one-half of the digestive disorders met with in the horse, and hence the reader can not fail to see how very important it is to have some proper ideas concerning these subjects.

Kinds of food.—In this country horses are fed chiefly upon hay, grass, roots, oats, corn, wheat, and rye. Many think that they could be fed on nothing else. Stewart, in "The Stable Book," gives the following extract from Loudon's Encyclopedia of Agriculture, which is of interest at this point:

> In some sterile countries they (horses) are forced to subsist on dried fish, and even on vegetable mold; in Arabia, on milk, flesh-balls, eggs, broth. In India horses are variously fed. The native grasses are judged very nutritious. Few, perhaps no oats are grown; barley is rare, and not commonly given to horses. In Bengal a vetch, something like the tare, is used. On the western side of India a sort of pigeon-pea, called gram (*Cicer arietinum*) forms the ordinary food, with grass while in season, and hay all the year round. Indian corn or rice is seldom given. In the West Indies maize, guinea corn, sugar corn tops, and sometimes molasses, are given. In the Mahratta country salt, pepper, and other spices are made into balls, with flour and butter, and these are supposed to produce animation and to fine the coat. Broth made from sheep's head is sometimes given. In France, Spain, and Italy, besides the grasses, the leaves of limes, vines, the tops of acacia, and the seeds of the carob-tree are given to horses.

For information as to the nutritive value, chemistry, and classification of the different kinds of food, I will refer the reader again to Smith's Veterinary Hygiene.

We can not, however, leave aside entirely here a consideration of the digestibility of foods; and by this we mean the readiness with which foods undergo those changes in the digestive canal that fit them for absorption and deposition as integral parts of the animal economy.

The age and health of the animal will, of course, modify the digestibility of foods, as will also the manner and time of harvesting, preserving, and preparing the foods.

In the horse digestion takes place principally in the intestines, and here, as in all other animals and with all foods, we find that a certain part only of the provender is digested; another portion is indigested. This proportion of digested and indigested food must claim passing notice at least, for if the horse receives too much food a large portion

of digestible food must pass out unacted upon, entailing not only the loss of this unused food, but also calling for an unnecessary expenditure of vital force on the part of the digestive organs of the horse. It is thus that, in fact, too much food may make an animal poor.

In selecting food for the horse we should remember the anatomical arrangement of the digestive organs, as well as the physiological functions performed by each organ. Foods must be wholesome, clean, and sweet; the hours of feeding regular; the mode of preparation found by practical experience to be the best must be adhered to, and cleanliness in preparation and administration must be observed.

The length of time occupied by stomach digestion in the horse varies with the different foods. Hay and straw pass out of the stomach more rapidly than oats. It would seem to follow, then, that oats should be given after hay, for if reversed the hay would cause the oats to be sent onward into the intestines before being fully acted upon by the stomach, and as a result produce indigestion. Experience confirms this. There is another good reason why hay should be given first, particularly if the horse is very hungry or if exhausted from overwork, namely, it requires more time in mastication (insuring proper admixture of saliva) and can not be bolted as are the grains. In either instance water must not be given soon after feeding, as it washes or sluices the food from the stomach before it is fitted for intestinal digestion.

The stomach begins to empty itself very soon after the commencement of feeding, and continues rapidly while eating. Afterwards the passage is slower, and several hours are required before the stomach is entirely empty. The nature of the work required of the horse must guide us in the selection of his food. Rapid or severe labor can not be performed on a full stomach. For such horses food must be given in small quantity and fed to them about two hours before going to their work. Even horses intended for slow work must never be engorged with bulky, innutritious food immediately before going to labor. The small stomach of the horse would seem to lead us to the conclusion that this animal should be fed in small quantities and often, which, in reality, should be done. The disproportion between the size of the stomach and the amount of water drank tells us plainly that the horse should always be watered before feeding. One of the common errors of feeding, and the one that produces more digestive disorders than any other, is *to feed too soon after a hard day's work.* This must never be done. If a horse is completely jaded it will be found beneficial to give him an alcoholic stimulant on going into the stable. A small quantity of hay may then be given, but his grain should be withheld for one or two hours. These same remarks will apply with equal force to the horse that for any reason has been fasting for a long time. After a fast feed less than the horse would eat; for if allowed too much the stomach becomes engorged, its walls paralyzed, and "colic" is almost sure to follow. The horse should be fed three or four times a day; nor

will it answer to feed him entirely upon concentrated food. Bulky food must be given to detain the grains in their passage through the intestinal tract; bulk also favors distention, and thus mechanically aids absorption. To horses that do slow work for the greater part of the time, chopped or cut hay fed with crushed oats, ground corn, etc., is the best manner of feeding, as it gives the required bulk, saves time, and half the labor of feeding.

Sudden changes of diet are always dangerous.—When desirous of changing the food, do so very gradually. If a horse is accustomed to oats a sudden change to a full meal of corn will almost always sicken him. If we merely intend to increase the quantity of the *usual* feed, this again must be done gradually. The quantity of food given must always be in proportion to the amount of labor to be performed. If a horse is to do less work, or rest entirely from work for a few days, see that he receives less feed. If this was observed even on Saturday night and Sunday there would be fewer cases of "Monday morning sickness," such as colics and lymphangitis. Foods should also be of a more laxative nature when the horse is to stand for some days. Above all things we should avoid feeding musty or moldy foods. These are very frequent causes of disease of different kinds. Lung trouble, as bronchitis and "heaves," often follows the use of such food. The digestive organs always suffer from moldy or musty foods. Musty hay is generally considered to produce disorder of the kidneys; and all know of the danger to pregnant animals from feeding upon ergotized grasses or grains.

Leaving these somewhat general considerations, I will refer briefly to the different kinds of foods:

Hay.—The best hay for horses is timothy. It should be about one year old, of a greenish color, crisp, clean, fresh, and possessing a sweet, pleasant aroma. Even this good hay, if kept for too great a length of time, loses part of its nourishment, and while it may not be positively injurious, it is hard, dry, and indigestible. New hay is difficult to digest, produces much salivation (slobbering) and occasionally purging and irritation of the skin. If fed at all it should be mixed with old hay.

Second crop or aftermath.—This is not considered good hay for horses, but it is prized by some farmers as a good food for milch cows, they claiming that it increases the flow of milk. The value of hay depends upon the time of cutting, as well as care in curing. Hay should be cut when in full flower, but before the seeds fall; if left longer, it becomes dry and woody and lacks in nutrition. An essential point in making hay is that when the crop is cut it should remain as short a time as possible in the field. If left too long in the sun it loses color, flavor, and dries or wastes. Smith asserts that one hour more than is necessary in the sun causes a loss of 15 to 20 per cent. in the feeding value of hay. It is impossible to state any fixed time that hay must have to cure, this depending, of course, upon the weather, thickness of

the crop, and many other circumstances; but it is well known that in order to preserve the color and aroma of hay it should be turned or tedded frequently and cured as *quickly as possible.* On the other hand, hay spoils in the mow if harvested too green or when not sufficiently dried. Mow-burnt hay produces disorder of the kidneys and bowels and causes the horse to fall off in condition. Musty or moldy hay has often been said to produce that peculiar disease known variously as cerebro-spinal meningitis, putrid sore throat, or choking distemper.

The average horse, getting grain, should be allowed from 10 to 12 pounds of good hay a day. It is a mistake of many to think that horses at light work can be kept entirely on hay. Such horses soon become pot-bellied, fall off in flesh, and do not thrive. The same is true of colts; unless the latter are fed with some grain they grow up to be long, lean, gawky creatures, and never make as good horses as those accustomed to grain, with or in addition to their hay.

Straw.—The straws are not extensively fed in this country, and when used at all they should be cut and mixed with hay and ground or crushed grains. Wheat, rye, and oats straw are the ones most used, and of these oats straw is most easily digested and contains the most nourishment. Pea and bean straw are occasionally fed to horses, the pea being preferable according to most writers.

Chaff.—Wheat and rye chaff should never be used as a food for horses. The beards frequently become lodged in the mouth or throat and are productive of more or less serious trouble. In the stomach and intestines they often serve as the nucleus of the "soft concretions" which are to be described when treating of obstructions of the digestive tract.

Oat chaff, if fed in small quantities and mixed with cut hay or corn-fodder, is very much relished by horses. It is not to be given in large quantities, as I have repeatedly witnessed a troublesome and sometimes fatal diarrhea to follow the practice of allowing horses or cattle free access to a pile of oat chaff.

Grains.—Oats take precedence of all grains as a food for horses, as the ingredients necessary for the complete nutrition of the body exist in them in the best proportions. Oats are besides more easily digested and a larger proportion absorbed and converted into the various tissues of the body. Care must be taken in selecting oats. According to Stewart the best oats are one year old, plump, short, hard, clean, bright, and sweet. New oats are indigestible. Kiln-dried oats are to be refused as a rule, for even though originally good this drying process injures them. Oats that have sprouted or fermented are injurious and should never be fed. Oats are to be given either whole or crushed; whole in the majority of instances, crushed to old horses and those having defective teeth. Horses, also, that bolt their feed are best fed upon crushed oats and out of a manger large enough to permit of spreading the grain in a thin layer.

The average horse requires, in addition to the allowance of hay above spoken of, about 12 quarts of good oats daily. The best oats are those cut about one week before being fully ripe. Not only is the grain richer at this time in nutritive materials, but there is also less waste from "scattering" than if left to become dead ripe. Moldy oats, like hay and straw, not only produce serious digestive disorders, but have been the undoubted cause of outbreaks of that dread disease in horses, already referred to, characterized by inability to eat or drink, sudden paralysis, and death.

Wheat and rye.—These grains are not to be used as food for horses except in small quantities, bruised or crushed, and fed mixed with other grains or hay. If fed alone, in any considerable quantities, they are almost certain to produce digestive disorders, laminitis (founder), and similar troubles. They should never constitute more than one-fourth of the grain allowance, and should always be ground or crushed.

Bran.—The bran of wheat is the one most used, and its value as a feeding stuff is variously estimated. It is not to be depended upon if given alone, but may be fed with other grains. It serves to keep the bowels open. Sour bran is not to be given. It disorders the stomach and intestines and may even produce serious results.

Maize—Corn.—This grain is not suitable as an exclusive food for young horses, as it is deficient in salts. It is fed whole or ground. Corn on the cob is commonly used as the food for horses affected with "lampas." If the corn is old and is to be fed in this manner it should be soaked in pure, clean water for ten or twelve hours. Corn is better given ground, and fed in quantities of from 1 to 2 quarts at a meal mixed with crushed oats or wheat bran. We must be very particular in giving corn to a horse that is not accustomed to its use. It must be commenced in small quantities and very gradually increased. I know of no grain more likely to produce what is called acute indigestion than corn if these directions are not observed.

Linseed.—Ground linseed is occasionally fed with other foods to keep the bowels open and to improve the condition of the skin. It is of particular service during convalescence, when the bowels are sluggish in their action. Linseed tea is very often given in irritable or inflamed conditions of the digestive organs.

Roots—Potatoes.—These are used as an article of food for the horse in many sections. If fed raw and in large quantities they often produce indigestion. Their digestibility is favored by steaming or boiling. They possess, in common with other roots, slight laxative properties.

Beets.—These are not much used as food for horses.

Carrots.—These make a most excellent food, particularly during sickness. They improve the appetite and slightly increase the action of the bowels and kidneys. They possess also certain alterative properties. The coat becomes smooth and glossy when carrots are fed. Some veterinary writers claim that chronic cough is cured by giving carrots for

sometime. The roots may be considered then as an adjunct to the regular regime, and if fed in small quantities are highly beneficial.

Grasses.—Grass is the natural food of horses. It is composed of a great variety of plants, differing widely as to the amount of nourishment contained, some being almost entirely without value as foods and only eaten when there is nothing else obtainable, others are positively injurious or even poisonous. None of the grasses are sufficient to keep the horse in condition for work. Horses thus fed are "soft," sweat easily, purge, and soon tire on the road or when at hard work. To growing stock grass is indispensible, and there is little or no doubt but that it acts as an alterative when given to horses accustomed to grain and hay. It must be given to such subjects in small quantities at first. The stomach and intestines undergo rest, and recuperate if the horse is turned to grass for a time each year. It is also certain that during febrile diseases grass acts almost as a medicine, lessening the fever and favoring recovery; wounds heal more rapidly than when the horse is on grain, and some chronic disorders (chronic cough for instance) disappear entirely when at grass. In my experience grass does more good when the horse crops it himself. This may be due to the sense of freedom he enjoys at pasture, to the rest to his feet and limbs, and for many similar reasons. When cut for him it should be fed fresh or when but slightly wilted.

PREPARATION OF FOODS.

Foods are prepared for feeding for any of the following reasons: To render the food more easily eaten; to make it more digestible; to economize in amount; to give it some new property, and to preserve it. We have already spoken of the preparation of drying, and need not revert to this again, as it only serves to preserve the different foods. Drying does, however, change some of the properties of food, *i. e.*, removes the laxative tendency of most of them.

The different grains are more easily eaten when ground, crushed, or even boiled. Rye or wheat should never be given whole, and even of corn it is found that there is less waste when ground, and, in common with all grains, it is more easily digested than when fed whole.

Hay and fodder are economized when cut in short pieces. Not only will the horse eat the necessary amount in a shorter time, but it will be found that there is less waste, and the mastication of the grains (whole or crushed) fed with them is insured.

Reference has already been made to those horses that bolt their food, and we need only remark here that the consequences of such ravenous eating may be prevented if the grains are fed with cut hay, straw, or fodder. Long or uncut hay should also be fed, even though a certain amount of hay or straw is cut and fed mixed with grain.

One objection to feeding cut hay mixed with ground or crushed grains, and wetted, must not be overlooked during the hot months. Such food

is apt to undergo fermentation if not fed directly after it is mixed, and the mixing-trough even, unless frequently scalded and cleaned, becomes sour and enough of its scrapings are given with the food to produce flatulent (wind) colic. A small amount of salt should always be mixed with such food.

Bad hay should never be cut simply because it insures a greater consumption of it; bad foods are dear at any price and should never be fed. We have before spoken of the advantage of boiling roots. Not only does this render them less liable to produce digestive disorders, but it also makes them clean. Boiling or steaming grains is to be recommended when the teeth are poor, or when the digestive organs are weak. Of ensilage as a food for horses I have no experience, but am inclined to think that (and this opinion is based upon the imperfect manner in which the crop is often stored) disordered digestion would be more frequent were it extensively fed.

DISEASES OF THE TEETH.

Dentition.—This covers the period during which the young horse is cutting his teeth, from birth to the age of five years. With the horse more difficulty is experienced in cutting the second or permanent teeth than with the first or milk teeth. There is a tendency among farmers and many veterinarians to pay too little attention to the teeth of young horses. Percivall relates an instance illustrative of this, that is best told in his own words:

> I was requested to give my opinion concerning a horse, then in his fifth year, who had fed so sparingly for the last fortnight, and so rapidly declined in condition in consequence, that his owner, a veterinary surgeon, was under no light apprehensions about his life. He had himself examined his mouth, without having discovered any defect or disease; though another veterinary surgeon was of opinion that the difficulty or inability manifested in mastication, and the consequent cudding, arose from preternatural bluntness of the surfaces of the molar teeth, which were, in consequence filed, but without beneficial result. It was after this that I saw the horse; and I confess I was, at my first examination, quite as much at a loss to offer any satisfactory interpretation as others had been. While meditating, however, after my inspection, on the apparently extraordinary nature of the case, it struck me that I had not seen the tusks. I went back into the stable and discovered two little tumors, red and hard, in the situation of the inferior tusks, which, when pressed, gave the animal insufferable pain. I instantly took out my pocket-knife and made crucial incisions through them both, down to the coming teeth, from which moment the horse recovered his appetite and by degrees his wonted condition.

The mouths of young horses should also be frequently examined to see if one or more of the milk teeth are not remaining too long, causing the second teeth to grow in crooked, in which case the first teeth should be removed by the forceps.

Irregularities of teeth.—There is quite a fashion of late years, especially in large cities, to have horses' teeth regularly "floated" or "rasped" by "veterinary dentists." In some instances this is very beneficial, while in most cases it is entirely unnecessary. From the character of

the food, the rubbing or grinding surface of the horse's teeth should be *rough*. Still we must remember that the upper jaw is somewhat wider than the lower, and that from the fact of the teeth not being perfectly apposed, a sharp ridge is left unworn on the inside of the lower molars and on the outside of the upper, which may excoriate the tongue or lips to a considerable extent. This condition can readily be felt by the hand, and these sharp ridges when found should be rasped down by a guarded rasp. Any one can do this without the aid of the veterinarian. In some instances the first or last molar tooth is unnaturally long, owing to the absence of its fellow on the opposite jaw. Should it be the last molar that is thus elongated it will require the aid of the veterinary surgeon, who has the necessary forceps or chisel for cutting it. The front molar may be rasped down, if much patience is taken. In decay of the teeth it is quite common to find the tooth corresponding to the decayed one on the opposite jaw very much elongated, sometimes to that extent that the mouth can not be perfectly closed. Such teeth must also be shortened by the bone forceps, chisel, bone-saw, or rasp. In all instances where horses "quid" their food, where they are slobbering, or where they evince pain in mastication, shown by holding their head to one side while chewing, the teeth should be carefully examined. If, as is mostly the case, all these symptoms are referable to sharp corners or projections of the teeth, these must be removed by the rasp. If decayed teeth are found, or other serious difficulty detected, an expert should be called.

Toothache.—This is rare in the horse and is mostly witnessed where there is decay of a tooth. I have observed it only in the molar teeth. Toothache is to be discovered in the horse by the pain expressed by him while feeding or drinking cold water. I have seen horses affected with toothache that would suddenly stop chewing, throw the head to one side, and slightly open the mouth. They behave as though some sharp body had punctured the mouth. If upon examination there is no foreign body found we must then carefully examine each tooth. If this can not be done with the hand in the mouth we can, in most instances, discover the aching tooth by pressing each tooth from without. The horse will flinch when the sore tooth is pressed upon. In most cases there is nothing to be done but the extraction of the decayed tooth, and this, of course, is only to be attempted by the veterinarian.

There is a *deformity*, known as parrot-mouth, that interferes with prehension, mastication, and, indirectly, with digestion. The upper incisors project in front of and beyond the lower ones. The teeth of both jaws become unusually long, as they are not worn down by friction. Such horses experience much difficulty in grazing. Little can be done except to occasionally examine the teeth, and if those of the lower jaw become so long that they bruise the "bars" of the upper jaw, they must be shortened by the rasp or saw. Horses with this deformity should never be left entirely at pasture.

DISEASES OF THE MOUTH.

Lampas is the name given to a swelling of the mucous membrane covering the hard palate and projecting in a more or less prominent ridge immediately behind the upper incisors. There is no doubt but that in some rare instances, and particularly while teething, there is a congestion and swelling of this part of the roof of the mouth which may interfere with feeding. In one instance in my practice I found the swelling so extensive that the mucous membrane was caught between the front teeth when the horse attempted to eat. Should this exist the swollen parts are to be scarified, being careful not to cut deeply into the structures. An astringent wash of alum water may also be beneficial. Burning of the lampas is cruel and unnecessary, and should never be permitted, as it often causes serious results to follow.

It is quite a common opinion among owners of horses and stablemen that lampas is a disease that very frequently exists. In fact whenever a horse fails to eat, and if he does not exhibit very marked symptoms of a severe illness, they say at once "he has the lampas." It is almost impossible to convince them to the contrary, yet in a practice extending over fifteen years I have never seen but two or three cases of what is called lampas that gave rise to the least trouble or that called for any treatment whatever. It may be put down, then, as more a disease of the stableman's imagination than of the horse's mouth.

Stomatitis.—This is an inflammation of the mucous membrane lining the mouth and is produced by irritating medicines, foods, or other substances. In cities it frequently follows from eating out of ash-barrels. The symptoms are swelling of the mouth, which is also hot and painful to the touch; there is a copious discharge of saliva; the mucous membrane is reddened, and in some cases there are observed vesicles or ulcers in the mouth. The treatment is simple, soft feed alone often being all that is necessary. In some instances it may be advisable to use a wash of chlorate of potash, borax, or alum, about one-half ounce to a pint of water. Hay, straw, or oats should not be fed unless steamed or boiled.

Glossitis, or inflammation of the tongue, is very similar to the above, and mostly exists with it and is due to the same causes. Injuries to the tongue may produce this simple inflammation of its covering membrane, or, if severe, may produce lesions much more extensive, such as lacerations, abscesses, etc. These latter would require surgical treatment, but for the simpler forms of inflammation of the tongue the treatment recommended for stomatitis should be followed.

Ptyalism or salivation consists in an abnormal and excessive secretion of saliva. This is often seen as a symptom of irregular teeth, inflammation of the mouth or tongue, or of the use of such medicines as lobelia, mercury, and many others. Some foods produce this, as clover, and particularly second crop; foreign bodies, as nails, wheat-chaff, and

corn-cobs becoming lodged in the mouth. If the cause is removed, as a rule no further attention is necessary. Astringent washes may be applied to the mouth as a gargle or by means of a sponge.

Pharyngitis is an inflammation of the mucous membrane lining of the pharynx (back part of the mouth). It rarely exists unless accompanied by stomatitis, glossitis, or laryngitis. In those instances where the inflammation is mostly confined to the pharynx we notice febrile symptoms—difficulty of swallowing either liquids or solids; there is but little cough except when trying to swallow; there is no soreness on pressure over larynx (large ring of the windpipe). Increased flow of saliva, difficulty of swallowing liquids in particular, and cough only when attempting to swallow, are the symptoms best marked in pharyngitis. For treatment, chlorate of potash in half-ounce doses three or four times a day is the best. This may be given suspended in warm water as a gargle, or may be mixed with licorice-root powder and honey and given with a strong spoon or wooden paddle. Borax or alum water may be substituted for chlorate of potash in the same-sized doses. Soft food should be given, but I have seen some cases where the animal would eat corn from the cob better than anything else.

Paralysis of the pharynx, or, as it is commonly called, "paralysis of the throat," is one of the most stubborn diseases of the horse that we are ever called to treat. A horse is suddenly noticed to be unable to eat, and his manger is found to contain much saliva and frothy food that has been returned through his nose. The *symptoms* which enable us to tell that paralysis of the pharynx exists are as follows: The owner says he has a horse that "can't eat." That is all he knows. We find the animal with a somewhat anxious countenance; manger, as above described; pulse, respiration, and temperature, at first, about the same as in health; the horse will constantly try to eat or drink, but is unable to do so; if water be offered him from a pail he will apparently drink with avidity, but, if we notice, the quantity of water in the pail remains about the same; he will continue trying to drink by the hour; if he can succeed in getting any fluid in to the back part of the mouth it comes out at once through the nose. Foods also return through the nose, or are dropped from the mouth, quidded. An examination of the mouth by inserting the hand fails to find any obstruction or any abnormal condition, except, perhaps, that the parts are too flabby to the touch. These cases go on from bad to worse; the horse constantly and rapidly loses in condition, becomes very much emaciated, the eyes are hollow and lustreless, and death soon occurs from inanition.

Treatment is very unsatisfactory. Severe blisters should be applied behind and under the jaw; the mouth is to be frequently swabbed out with alum or chlorate of potash, 1 ounce to a pint of water, by means of a sponge fastened to the end of a stick. Strychnia is the best agent to be used to overcome this paralysis, and should be given in 1-grain doses three or four times a day. If the services of a veterinarian can

be obtained he should give this medicine by means of a hypodermic syringe, injecting it deeply into the pharynx. In my experience the blister externally, the frequent swabbing of the mouth, as above described, and the use of a nerve stimulant are all that can be done. This disease may be mistaken at times for foreign bodies in the mouth or for the so called cerebro-spinal meningitis. It is to be distinguished from the former by a careful examination of the mouth, the absence of any offending body, and by the flabby feel of the mouth; from the latter by the animal appearing in perfect health in every particular except this inability to eat or drink.

Abscesses sometimes form in the pharynx and give rise to symptoms resembling those of laryngitis or distemper. Interference with breathing, that is of recent origin, and progression, without any observable swelling or soreness about the throat, will make us suspect the formation of an abscess in this location. But little can be done in the way of treatment, save to hurry the ripening of the abscess and its discharge, by steaming with hops, hay, or similar substances. If the abscess can be felt through the mouth it must be opened by the attending veterinary surgeon.

DISEASES OF THE ŒSOPHAGUS OR GULLET.

It is rare to find disease of this organ, except as a result of the introduction of foreign bodies too large to pass, or to the exhibition of irritating medicines. Great care should be taken in the administration of irritant or caustic medicines that they be thoroughly diluted. If this is not done erosions and ulcerations of the throat ensue, and this again is prone to be followed by constriction—narrowing—of the gullet. The mechanical trouble of choking is quite common. It frequently occurs when the animal is suddenly startled while eating apples or roots, and we should be careful never to suddenly approach or put a dog after horses or cows that are feeding upon such substances. If left alone they very rarely attempt to swallow the object until it is sufficiently masticated.

Choking also arises from feeding oats in a deep, narrow manger, to such horses as eat very greedily, or bolt their food. Wheat chaff is also a frequent source of choke. This accident may result from the attempts to force eggs down without breaking or from giving balls that are too large or not of the proper shape.

Whatever object causes the choking, it may lodge in the upper part of the œsophagus, at its middle portion, or close to the stomach, giving rise to the designations of *pharyngeal*, *cervical*, and *thoracic* choke. In some cases where the original obstruction is low we find all that part of the gullet above it to be distended with food.

The *symptoms* will vary according to the position of the body causing choke. In *pharyngeal choke* the object is lodged in the *upper portion* of the œsophagus. The horse will present symptoms of great distress,

hurried breathing, frequent cough, excessive flow of saliva, sweating, trembling, or stamping with the fore-feet. The abdomen rapidly distends with gas. The diagnosis is completed by manipulating the upper part of the throat from without and by the introduction of the hand into the back part of the mouth, finding the body lodged here. In *cervical choke* (where the obstruction is situated at any point between the throat-latch and the shoulder) the object can both be seen and felt. The symptoms here are not so severe; the horse will be seen to occasionally draw himself up, arch his neck, and sometimes utter a loud shriek; the expression becomes anxious, and attempts at vomiting are made. The abdomen is mostly full and tympanitic. Should there be any question as to the trouble a decided conclusion may mostly be reached by pouring water into the throat from a bottle. If the obstruction is complete you can see the gullet become distended with each bottle of water by standing on the left side of the horse and watching the course of the œsophagus, just above the windpipe. This is not always a sure test, as the obstruction may be an angular body, in which case liquids would pass it. Solids taken would show in these cases; but solids should not, however, be given, as they serve to increase the trouble by rendering the removal of the body more difficult. In cervical choke one can always, with a little care, feel the imprisoned object.

In *thoracic choke* the symptoms are still less severe. Our attention will be directed to this part of the œsophagus by food or water being ejected through the nose or mouth after the animal has taken a few swallows. There will be some symptoms of distress, fullness of the abdomen, cough, and occasionally the crying or shrieking as heard in cervical choke. The diagnosis is complete if, upon passing the probang (a hollow, flexible tube made for this purpose), an obstruction is encountered.

Treatment.—If the choke is at the beginning of the gullet (*pharyngeal*) we must endeavor to remove the obstacle through the mouth. A mouth-gag or speculum is to be introduced into the mouth to protect the hand and arm of the operator. Then while an assistant, with his hands grasped tightly *behind* the object, presses it upward and forward with all his force, the operator must pass his hand into the mouth until he can seize the obstruction and draw it outward. This mode of procedure must not be abandoned with the first failure, as we may get the obstacle farther toward the mouth by continued efforts. If we fail with the hand, *forceps* may be introduced through the mouth and the object seized when it is just beyond the reach of the fingers. Should our efforts entirely fail we must then endeavor to force the obstruction downward by means of the probang. This instrument, which is of such signal service in removing choke in cattle, is decidedly more dangerous to use for the horse, and I can not pass this point without a word of caution to those who have been known to introduce into the horse's throat such objects as whip-stalks, shovel-handles, etc. These are

always dangerous, and I have seen more than one horse die from this barbarous treatment.

Cervical choke.—In this, as well as in thoracic choke, we must first of all endeavor to soften or lubricate the obstruction by pouring oil or mucilaginous drinks down the gullet. After this has been done we are to endeavor to move the object by gentle manipulations with the hands. If choked with oats or chaff (and these are the objects that most frequently produce choke in the horse), we should begin by gently squeezing the lower portion of the impacted mass, and endeavoring to work it loose a little at a time. This is greatly favored at times if we apply hot fomentations immediately about the obstruction. We should persist in these efforts for at least an hour before deciding to resort to other and more dangerous modes of treatment. Should we fail, however, the probang may be used. In the absence of the regular instrument, which must always be flexible and finished with a smooth cup-shaped extremity, we may use a long piece of inch hose. The mouth is to be kept open by a gag of wood or iron and the head slightly raised and extended. The probang is then to be carefully guided by the hand into the upper part of the gullet and gently forced downward until the obstruction is reached. Pressure must then be gradual and firm. Do not, at first, attempt too much force, or the œsophagus will be ruptured. Simply keep up this firm, gentle pressure until you feel the object moving, after which you are to rapidly follow it to the stomach. If, again, this mode of treatment is unsuccessful, a veterinarian or medical doctor is to be called in, who can remove the object by cutting down upon the gullet, opening it, and removing the offending body. This should scarcely be attempted by a novice, as a knowledge of the anatomy of the parts is essential to avoid cutting the large artery, vein, and nerve that are closely related to the œsophagus in its cervical portion.

Thoracic choke can only be treated by means of the introduction of oils and mucilaginous drinks and the careful use of the probang. Some practitioners speak very highly of the value of thick soap-suds, generously horned down the animal's throat.

Stricture of the œsophagus is mostly due to corrosive medicines, previous choking (accompanied by lacerations, which, in healing, narrow the passage), and pressure on the gullet by tumors. In the majority of cases of *stricture* we soon have *dilatation* of the gullet in front of the constricted portion. This dilatation is due to the frequent accumulation of solid food above the constriction. Little can be done in either of these instances except to feed on sloppy or liquid food.

Sacular dilatation of the œsophagus.—This mostly follows choking, and is due to rupture of the muscular coat of the gullet, allowing the internal or mucous coat to hernia or pouch through the lacerated muscular walls. This sac or pouch gradually enlarges, from the frequent imprisonment of food, until it presses upon the gullet and prevents swallowing. When liquids are taken the solid materials are partially washed

out of the pouch. The *symptoms* presenting themselves are as follows: The horse is able to swallow a few mouthfuls of food without apparent distress; then he will suddenly stop feeding, paw, contract the muscles of his neck, and eject a portion of the food through his nose or mouth. As the dilatation thus empties itself the symptoms gradually subside, only to re-appear when he has again taken solid food. Liquids pass without any, or but little, inconvenience. Should this dilatation exist in the *cervical* region, surgical interference may sometimes prove effectual; if in the *thoracic* portion, nothing can be done, and the patient rapidly passes from hand to hand by "swapping," until, at no distant date, the contents of the sac become too firm to be dislodged as heretofore, and the animal succumbs.

DISEASES OF THE STOMACH.

Impaction—Stomach staggers, or gorged stomach.—These are terms given to the stomach when it is so enormously distended with food that it loses all power of contracting upon its contents. It occurs most frequently in those horses that after a long fast are given a large feed, or in those that have gained access to the grain-bin and eaten ravenously. The proportionally small stomach of the horse, as well as his inability to vomit, will account for the frequency of stomach staggers. I have witnessed this trouble most frequently in teamsters' horses and those that are not fed as often as they should be. After a long fast it is the custom to feed abundantly. The horse bolts his food, and the stomach not having time to empty itself becomes distended and paralyzed. To prevent this condition it is sufficient to feed at shorter intervals, to give small quantities at a time, and to secure the feed-bins so that if a horse gets loose he can not "stuff himself to bursting."

Symptoms.—Percivall says that "a stomach simply surcharged with food, without any accompanying tympanitic distention, does not appear to occasion local pain, but to operate rather that kind of influence upon the brain which gives rise to symptoms, not stomachic, but cerebral. Hence the analogy between this disease and staggers, and hence the appellation for it of 'stomach staggers.'" The horse soon after eating becomes dull and heavy, or drowsy; slight colicky symptoms are observed, and are continuous; he rarely lies down, but carries his head extended and low, nearly touching the ground. Dullness rapidly increases, the eyes are partially closed, vision is impaired, he presses or thrusts his head against the manger or sides of the stall, and paws or even climbs with his fore feet. Respirations are less frequent than in health, the pulse slow and sluggish. All these symptoms rapidly increase in severity; he becomes delirious; cold sweats bedew the body; he trembles violently, slobbers or vomits a sour, fermenting mass, staggers from side to side, or plunges madly about until he drops dead. Usually the bowels are constipated, although (and especially if the engorgement is due to eating wheat or rye) diarrhea has been observed. These symptoms resemble in some particulars those of "blind" or

"mad" staggers, but if we are careful to get the *history* of the case, *i. e.*, ravenous eating after a long fast, or gaining access to grain-bins, we should not be in much danger of confounding them. *Post-mortem* examinations sometimes reveal rupture of the stomach, owing to its enormous distension, and to the violence with which he throws himself in his delirium. If not ruptured the stomach will be distended to its utmost.

Treatment for these cases is very unsatisfactory. A purgative of Barbadoes aloes, 1 ounce, should be given at once. We should then try to stimulate the walls of the stomach to contraction by giving cayenne pepper, one-half ounce, or half-ounce doses of Jamaica ginger. Injections into the rectum, last gut, of turpentine 2 ounces, in 8 ounces of linseed oil, may stimulate the bowels to act, and thus, in a measure, relieve the stomach. Cold applications applied to the head may in some cases relieve the cerebral symptoms already referred to, and some recommend bleeding for the same purpose.

Tympanites of the stomach.—This is of somewhat frequent occurrence, according to my observation, but is not, I believe, as a rule, separately treated of by works on veterinary medicine. It is similar in cause and symptoms to the above, yet distinct enough to enable the careful observer to readily differentiate between them. In tympanites of the stomach we find this organ to be greatly distended as before, but in this case its contents are gaseous, or probably a mixture of food and gases, like fermenting yeast. This disease of the horse corresponds exactly with "hoven" or "blown" in cattle, and may be due to overloading the stomach with young, succulent, growing herbage, clover in particular, from whose subsequent fermentation gas is liberated in quantities sufficient to enormously distend the stomach. Growing wheat or rye are also fertile causes of this distention if eaten in any considerable amounts. Another very frequent cause of stomach-bloat is overfeeding, particularly if given immediately before hard work. Many people, if they expect to make a long journey, think to fit their horses for the fatigue consequent thereto by giving an extra allowance of oats or other food just before starting. This is most injudicious. The horse starts to his work feeling full and oppressed; he soon grows dull and listless, and fails to respond to the whip; sweats profusely; attempts to lie down; his head is carried forward and downward, and if checked up is heavy on the reins, stumbles or blunders forward and often falls. If looked at carefully you can not fail to observe that he is unusually full over the posterior ribs. The flanks may also be distended with gas, and sound like a drum on being struck, though I have seen cases where the gases were entirely confined to the stomach. With this condition the pain and distress are constant; the swelling referred to plainly appreciable; head extended and low, retching or even vomiting of fermented food. On placing the ear to the horse's windpipe a distinct metallic sound can be heard, as of air rushing through the windpipe. Such cases are rapid in their course and often fatal.

Treatment must be prompt and energetic. An antacid should be given, and, as these cases mostly occur on the road away, probably, from all drug-stores, you should hasten to the first house. Get common baking soda, and administer 2 to 4 ounces of it as quickly as possible. One-half ounce of cayenne pepper may be added to this with advantage, as it serves to aid the stomach to contract upon its contents, and expel the gas. Charcoal, in any amount; chloride of lime, one-half ounce; carbonate of ammonia, one-half ounce; or any medicine that will check or stop fermentation, or absorb the gases, may be given. A physic of 1 ounce of aloes, or 1 pint of linseed oil should be given to unload the stomach and bowels. Cold water, dashed with force over the stomach, is thought by some to favor condensation of the gas. This lesson should be learned from one of these attacks—and doubtless will be if, as is often the case, the horse dies—that when a horse or any other animal is expected to do an unusual amount of work in a short time he will best do it upon a spare feed. Curb your generosity and humanity (?) for the brute until the journey's end, and even then wait until the horse is thoroughly rested before giving the usual feed.

Rupture of the stomach.—This mostly occurs as a result of engorged or tympanitic stomach, and from the horse violently throwing himself when so affected. It may result from disease of the coats of the stomach, gastritis, stones or calculi, tumors, or anything that closes the opening of the stomach into the intestines, and very violent pulling or jumping immediately after the animal has eaten heartily of bulky food. These or similar causes may lead to this accident.

The *symptoms* of rupture of the stomach are not constant, nor always reliable. We should always make inquiry as to what and how much the horse has been fed at the last meal. Vomiting has, pretty generally, been declared to be a symptom of rupture of this organ. I wish to preface what I may say concerning this with the statement that I have observed vomiting when the *post-mortem* examination revealed rupture; that I have found rupture of the stomach where vomiting had not occurred; that I have witnessed vomiting where the horse soon after made a rapid recovery, *i. e.*, when the stomach was not ruptured. In spite of this contradictory evidence, I am of the opinion that, taken in connection with other symptoms, this sign is of value as pointing toward rupture of the stomach. This accident has occurred in my practice mostly in heavy draught horses. A prominent symptom observed (though I have also seen it in diaphragmatic hernia) is where the horse, if possible, gets the front feet on higher ground than the hind ones, or sits on his haunches, like a dog. This position affords relief to some extent, and it will be maintained for some minutes; it is also quickly regained when the horse has changed it for some other. Colicky symptoms, of course, are present, and these will vary much, and present no diagnostic value. As the case progresses "the horse will often stretch forward the fore legs, lean backwards and down-

wards until the belly nearly touches the ground, and then rise up again with a groan, after which the fluid from his nostrils is issued in increased quantity." The pulse is fast and weak, breathing hurried, body bathed in a clammy sweat, limbs tremble violently, the horse reels or staggers from side to side, and death quickly ends the scene.

In the absence of any pathognomonic symptom Percivall says we must take into account the history of the case; the subject of it; the circumstances attending it; the swollen condition of the abdomen; the symptoms of colic that cease suddenly and are succeeded by cold sweats and tremors; the pulse from being quick and small and thready, growing weak and more frequent, and, at length running down and becoming altogether imperceptible; the countenance denoting gloom and despondency of the heaviest character; looking back at the flank and groaning; sometimes crouching with the hind quarters; with, or without eructation and vomiting.

There is no *treatment* that can be of any use whatever. Could we be sure of our diagnosis it would be better to destroy the animal at once. Since, however, there is always the possibility of a mistake in diagnosis, we may give powdered opium in 1-drachm doses every two or three hours, with the object of keeping the stomach as quiet as possible.

Gastritis is an inflammation of the mucous membrane lining the stomach. As an *idiopathic* disease it very rarely exists; but is mostly seen to be due to mechanical irritation, or to giving irritant and corrosive poisons in too large doses or without sufficient dilution. The *symptoms* are not well marked; there is a febrile condition, colicky pains, and, mostly, *intense thirst.* When poisons have produced gastritis there will be other symptoms referable to the action of the particular poison swallowed. If, for instance, the gastritis is due to a salt of lead we must expect to find difficult or labored breathing, abdominal pains, partial paralysis of extensor muscles primarily, tottering gait, convulsions, and death. Where the poisoning by lead is gradual the symptoms differ somewhat. There is a general appearance of unthriftiness, loss of appetite, staring coat, constipation, watery swellings under the jaws, a gray or blue line along the margin of the gums, and a progressive paralysis, noted often at first in the anterior extremities. Colicky symptoms are also observed. Abortion is often noticed during chronic lead-poisoning. In all cases of lead-poisoning the stomach, and often intestines, show erosions of its lining membrane, which in other parts is darker in color, and the mucous membrane is easily stripped off. Chronic poisoning by lead is to be expected near paint works, about newly-painted buildings, where paint kegs are left in the fields, where horses take small particles of lead with their food, where soft water runs through new lead pipes, and where the drinking water is drawn from wells or cisterns containing lead. Lead can be detected in almost all parts of the body at the *post-mortem* examination of chronic poisoning.

Treatment.—In acute gastritis, due to the careless or accidental administration of large quantities of this poison, we must give sulphuric acid, 30 to 60 drops well diluted with water, milk, white of eggs, oils, and demulcent drinks, as linseed gruel or tea. If the gastritis is chronic, due to the long ingestion of small particles of lead, we must administer from one-half to 1 pound of Epsom salts. Iodide of potassium in 1-drachm doses, twice or thrice daily, are here of much service. If much pain exists it may be relieved by giving morphia in 3 to 5 grain doses, repeated two or three times a day.

Where arsenic is the poison producing gastritis or gastro-enteritis (inflammation of the stomach and bowels), we have symptoms of abdominal pain, nausea, or vomiting, purging that is accompanied by an offensive odor, staggering gait, quickened breathing, paralysis of the hind extremities, and death. On opening a horse that has died of arsenical poisoning we are struck by the escape of large quantities of offensive gas. There are patches of inflammation and extravasation of blood in the stomach, and often in the intestines. Chemical tests should be resorted to before giving a decided opinion that death is due to arsenic. Poisoning from this agent is most common where sheep have been dipped in arsenical preparations for the "scab" and then allowed to run on pasture without first drying their wool. Arsenic is thus deposited upon the grass and is eaten by horses grazing thereon, producing the symtoms of gastritis and death. Gastritis may also occur from poisoning by copper, the mercurials, and some vegetable drugs. Gastritis produced by any of the irritant poisons is to be treated with oils and demulcent drinks. Opium may be given to allay pain and inflammation. Care should be observed in feeding for a time, being careful to give only soft and easily digested foods.

BOTS—LARVÆ OF THE GAD-FLY.

There are such erroneous opinions extant concerning the bot and the depredations it is supposed to commit upon the horse that a somewhat careful study should be made of it.

Of the many insect parasites and tormentors of solipeds the gad-flies (Œstridæ) are of the most importance. Cobbold, who is the best authority on the subject, says:

The common gad-fly (*Gastrophilus equi*) attacks the animal while grazing late in the summer, its object being, not to derive sustenance, but to deposit its eggs. This is accomplished by means of a glutinous excretion, causing the ova (eggs) to adhere to the hairs. The parts selected are chiefly those of the shoulder, base of the neck, and inner part of the fore legs, especially about the knees, for in these situations the horse will have no difficulty in reaching the ova with its tongue. When the animal licks those parts of the coat where the eggs have been placed the moisture of the tongue, aided by warmth, hatches the ova, and in something less than three weeks from the time of the deposition of the eggs the larvæ have made their escape. As maggots they are next transferred to the mouth and ultimately to the stomach along with food and drink. A great many larvæ perish during this passive mode of immigration, some being dropped from the mouth and others being crushed in the

fodder during mastication. It has been calculated that out of the many hundreds of eggs deposited on a single horse scarcely one out of fifty of the larvæ arrive within the stomach. Notwithstanding this waste the interior of the stomach may become completely covered (cuticular portion) with bots. Whether there be few or many they are anchored in this situation chiefly by means of two large cephalic hooks. After the bots have attained perfect growth they voluntarily loosen their hold and allow themselves to be carried along the alimentary canal until they escape with the feces. In all cases they sooner or later fall to the ground and when transferred to the soil they bury themselves beneath the surface in order to undergo transformation into the pupa condition. Having remained in the earth for a period of six or seven weeks they finally emerge from their pupal-cocoons as perfect dipterous (winged) insects—the gad-fly. It thus appears that bots ordinarily pass about eight months of their lifetime in the digestive organs of the horse.

The species just described infest chiefly the stomach and duodenum—small gut leading from the stomach.

Another species of *œstrus* affecting the horse is the *œstrus hæmorrhoidalis.* These are found fastened to the mucous membrane of the rectum, (last gut) or even outside upon the anus, and occasion much irritation and annoyance, and, at times, require to be removed by the fingers or forceps.

The opinion, almost universally entertained, that bots frequently cause colicky pains, is erroneous. It is very common to hear by-standers declare that almost every horse with abdominal pains "has the bots," and their suggested treatment is always varied and heroic.

Almost all horses in the country, as well as horses in the cities during their first year there, have "the bots." It is in exceptionally rare instances that they produce any appreciable symptoms or disturbances. In my own practice I have *never* known bots to be the cause of any serious ailment of the horse; and only *once* has my father, in a practice extending over fifty years, known bots to be the cause of death. In this instance the bots seemed to have simultaneously loosened their hold upon the mucous lining of the stomach, and were forced as an impermeable wedge into the pyloric orifice, or outlet, of the stomach, and thus, preventing the passage of food or medicine, produced death. Were the bots to attempt to fasten themselves to the sensitive lining of the bowels in their outward passage they might cause irritation and expressions of pain in the form of colicky symptoms, but this they seldom or never do. The opinion frequently expressed at *post-mortem* examinations, when the stomach is found to be ruptured, that "the bots have eaten through the stomach," is again a mistake. *Bots never do this;* the rupture is due to overdistention of the viscus with food or gases. Some writers on veterinary medicine have even urged that bots, by their presence, stimulated the stomach secretions, and were thus actually an *aid* to digestion. This opinion is as far from the truth as the more general one referred to above, concerning the harm they do.

Bots may, and probably do, when in large enough numbers to be fastened to the true digestive portion of the stomach, slightly interfere with digestion; the animal may not thrive, the coat stares, and emacia-

tion may follow; but beyond this, with the exception already noted, *they are harmless.* Even were they the cause of trouble, there are no medicines that affect them; neither acids, nor alkalies, anthelmintics (worm medicines), nor anodynes cause them to become loose and to pass out of the body. To prevent them it is necessary to watch for their eggs on the legs and different parts of the body in the late summer and autumn. These eggs are to be carefully scraped off and burned. Horses should not be watered from stagnant ponds, as they frequently swallow the ripening eggs with such water. It is entirely useless to attempt any treatment to rid the horse of bots; they go at their appointed time, and can not be dislodged before this. We should remember that in following their natural course or stages of existence the bots loosen their hold during May and June mostly. They are then expelled in great numbers, and horse-owners, noticing them in the manure, hasten to us saying "my horse has the bots." If we are honest we tell him that, in the natural course of events, nature is doing for him that which we can not do. We may say in conclusion, then, that bots seldom produce any evil effects whatever; that not more than once in ten thousand times are they the cause of colicky symptoms, and that they require no medicine to eject them.

INDIGESTION.

Indigestion is a term applied to all those conditions where, from any cause, digestion is imperfectly performed. It is not at all uncommon to witness in the horse symptoms similar to those of dyspepsia in man. The disturbances of digestion included under this head are not so pronounced as to produce colic, yet our consideration of diseases of the digestive organs would be incomplete if we failed to mention this, the most frequest of all digestive disorders. The seat and causes of indigestion are found to vary in different horses, or even in the same horse at different times. Apart from the indigestibility of the food itself there are many causes productive of indigestion. The teeth are often at fault. Where these are sharp, irregular, or decayed the food is imperfectly masticated and swallowed before there is a proper admixture with the saliva. Bolting of the food; the bile—secretion of the liver—may be defective in quality or quantity; there may be lack of secretion of the pancreatic juice, or there may be simply want of peristaltic movement of the stomach and intestines, thereby causing an interruption of the passage of the ingesta. The principal seat of indigestion, however, is in the stomach or small intestines. Whenever, from any cause, the secretions from these parts are excessive or difficient, dyspepsia or indigestion must invariably follow. Indigestion is often due to keeping horses on low, marshy pastures, and particularly during cold weather; wintering on hard, dry hay or corn-stalks, and other bulky and innutritive food; irregular feeding or overfeeding (though this latter is more likely to produce engorged stomach, or tympanites

of the stomach, which have been described by some as "acute indigestion.")

Symptoms.—Indigestion is characterized by irregular appetite; refusing all food at times, and at others eating ravenously; the appetite is not only irregular, but is often depraved; there is a disposition on the part of the horse to eat unusual substances, as wood, soiled bedding, or even his own feces; the bowels are irregular, to-day loose and bad smelling, to-morrow bound; grain often passed whole in the feces, and the hay passed in balls or impacted masses undergoing but little change; the horse frequently passes considerable quantities of wind that has a sour odor. The animal loses flesh, the skin presents a hard, dry appearance, and seems very tight (hide-bound). If these symptoms occur in a single horse in a stable where others are kept we must look, not to the feed, but to the animal himself for the cause of his trouble.

Treatment.—It is evident, from the many causes of indigestion and from its proteau forms, that we must be exceedingly careful in our examinations of the subject of this disorder. We must commence with the food, its quality, quantity, and time of feeding; examine the water supply, and see, besides, that it is given before feeding; then we must carefully observe the condition of the mouth and teeth; and, continuing our observations as best we may, endeavor to locate the seat of trouble —whether it is in the stomach, intestines, or annexed organs of digestion, as the liver and pancreas. If the teeth are sharp or irregular they must be rasped down; if any are decayed they must be extracted; if indigestion is due to ravenous eating or bolting the food, we must then feed from a large manger where the grain can be spread and the horse compelled to eat slowly.

In the great majority of cases I have found a cathartic, aloes 1 ounce, or linseed oil 1 pint, to be of much service if given at the outset. Any irritation, such as worms, undigested food, etc., that are operating as "causes," are thus removed, and in many instances no further treatment is required. There is mostly a tendency to distension of the stomach and bowels with gas during indigestion, and I have never found any treatment so effective as the following alkaline tonic: Baking soda, powdered ginger, and powdered gentian, equal parts. These are to be thoroughly mixed and given in heaping tablespoonful doses, twice a day, before feeding. This powder is best given by dissolving the above quantity in a half pint of water, and given as a drench.

INTESTINAL WORMS.

Although there are several species of worms found in the intestines of horses, it will be sufficient, in an article like this, to refer only to three or four of the most common ones. Worms are most frequently seen in young horses, and in those that are weak and debilitated. They commonly exist in horses that are on low, wet, or marshy pastures, and in those that drink stagnant water.

The intestinal worm most commonly seen is known as the *Lumbricoid* worm. In form it is much like the common earth-worm. It is white or reddish in color, and measures from 4 to 12 inches in length, though some have been seen that were nearly 30 inches long. In thickness they vary from the size of a rye straw to that of a lady's little finger, being thickest at the middle, and tapering at both ends. They are found singly or in groups or masses, and infest chiefly the small intestines.

Another common variety of intestinal worm is called the *pin-worm*, and is found mostly in the large intestines. These are semi transparent, thread-like worms, measuring in length from 1 to 2 inches.

The tape-worm, once seen, is easily recognized. It is white, flat, thin, broad, and jointed. The head is found at the smaller end of the worm. Tape-worms of the horse sometimes measure from 20 to 30 feet in length.

Symptoms of intestinal worms.—Slight colicky pains are noticed at times, or there may only be switching of the tail, frequent passages of manure, and some slight straining, itching of the anus, and rubbing of the tail or rump against the stall or fences; the horse is in poor condition; does not shed his coat; is hide-bound and pot-bellied; the appetite is depraved, licking the walls, biting the wooden work of the stalls, licking parts of his body, eating earth, and being particularly fond of salt; the bowels are irregular, constipation or diarrhea being noticed. Some place much dependence upon the symptom of itching of the upper lip, as shown by the horse frequently turning it up and rubbing it upon the wall or stalls. Others again declare that whenever we see the adherence of a dried whitish substance about the anus worms are present. The *one* symptom, however, that we should always look for, and certainly the only one that may not deceive us, is seeing the horse pass the worms in his dung.

Treatment.—Remedies to destroy intestinal worms are much more efficient if given after a long fast, and then the worm medicine must be supplemented by a physic to carry out the worms. Among the best worm medicines may be mentioned santonine, turpentine, tartar emetic, infusion of tobacco, and bitter tonics. To destroy tape-worms, areca nut, male-fern, and pumpkin seeds are the best. If a horse is passing the long round worms, for instance, the plan of treatment is to give twice daily for three or four days a drench composed of turpentine, 1 ounce, and linseed oil 2 or 3 ounces, to be followed on the fourth day by a physic of Barbadoes aloes, 1 ounce. If the pin-worms are present (the ones that infest the large bowels), injections into the rectum of infusions of tobacco, infusions of quassia chips, one-half pound to a gallon of water, once or twice daily for a few days, and followed by a physic, are most beneficial. It should be borne in mind that intestinal worms are mostly seen in horses that are in poor condition; and an essential part of our treatment then is to improve the appetite and

powers of digestion. This is best done by giving the vegetable tonics. One-half ounce of Peruvian bark, gentian, ginger, quassia, etc., is to be given twice a day in the feed or as a drench. Unless some such medicines and good food and pure water are given to tone up the digestive organs the worms will rapidly accumulate again, even though they may have all been expelled by the worm medicines proper.

DISEASES OF THE INTESTINES.

Spasmodic or cramp colic.—This is the name given to that form of colic produced by contraction, or spasm, of a portion of the small intestines. It is produced by indigestible food; foreign bodies, as nails and stones in the bowels; large drinks of cold water when the animal is warm; driving a heated horse through deep streams, cold rains, draughts of cold air, etc. Unequal distribution of or interference with the nervous supply here produces cramp of the bowels, the same as external cramps are produced. Spasmodic colic is much more frequently met with in high-bred, round-barreled nervous horses than in coarse, lymphatic ones.

Symptoms.—These should be carefully studied in order to diagnose this from other forms of colic requiring quite different treatment. Spasmodic colic always begins suddenly. If feeding, the horse is seen to stop abruptly, stamp impatiently, and probably look backwards. He soon evinces more acute pain, and this is shown by pawing, suddenly lying down, rolling, and getting up. There is then an interval of ease; he will resume feeding, and appear to be entirely well. In a little while, however, the pains return and are increased in severity, only to again pass off for a time. As the attack progresses these intervals of ease become shorter and shorter, and pain may be continuous, though even now there are exacerbations of pain. Animals suffering from this form of colic evince the most *intense* pain; they *throw* themselves down, roll over and over, jump up, whirl about, drop down again, paw, or strike, rather, with the front feet, steam and sweat, make frequent attempts to pass their urine, and the penis is partially erected. Only a small amount of water is passed at a time, and this is due to the bladder being so frequently emptied, *i. e., there is but little water to pass.* These attempts to urinate are almost always regarded as *sure* symptoms of trouble of the kidneys or bladder. In reality they are only one of the many ways in which the horse expresses the presence of pain. Allow me to digress slightly, and to assure the reader that diseases of the bladder or kidneys of the horse *are exceedingly rare.* The stomach and bowels are affected in a thousand instances where the kidneys or bladder are *once.* Attempts to pass water and failure to do so are not enough to warrant us in pronouncing the case one of "trouble with his water," nor should we, if a horse yields or sinks when pinched over the loins, declare that kidney disease exists. Try this pressure on any

horse, and the great majority will be seen to thus yield; in fact, this is rather a sign or symptom of health than of disease.

To recapitulate the symptoms of spasmodic colic: Keep in mind the history of the case, the type of horse, the suddenness of the attack, the intervals of ease (which become of shorter duration as the case progresses), the violent pain, the normal temperature and pulse during the intervals of ease, the frequent attempts to urinate, the erection of the penis, etc., and there is but little danger of confounding this with other forms of colic.

Treatment.—Since the pain is due to spasm or cramp of the bowels, medicines that overcome spasms—anti-spasmodics—are the ones indicated. Probably there is no medicine better than chloral hydrate. This is to be given in a dose of 1 ounce in a half pint of water as a drench. A very common and good remedy is sulphuric ether and laudanum; of each 2 ounces in half pint of linseed oil. Another drench may be composed of 2 ounces each of sulphuric ether and alcohol in 8 ounces of water. If nothing else is at hand we may give whisky; one-half pint in hot water. If relief is not obtained in one hour from any of the above doses, they may then be repeated. The body should be warmly clothed and perspiration induced. Blankets dipped in very hot water to which a small quantity of turpentine has been added should be placed around the belly and covered with dry blankets, or the abdomen may be rubbed with stimulating liniments or mustard-water. The difficulty, however, of applying hot blankets and keeping them in place forces us in most instances to dispense with them. If the cramp is due to irritants in the bowels a cure is not complete until we have given a cathartic of 1 ounce of aloes or 1 pint of linseed-oil. Injections into the rectum of warm, soapy water, or salt and water, aid the cure.

One word here about injections, or enemas, as they are called. These, as a rule, should be lukewarm and from 3 to 6 quarts are to be given at a time. They may be repeated every half hour if necessary. Great care is to be taken not to injure the rectum in giving rectal injections. A large syringe is the best means by which to give them. If this is not to be had, take a large elder, from which the pith has been removed, or a piece of hose. A large hog's bladder is to be filled with the fluid to be injected and tied about one end of the elder or hose. The point to be introduced into the rectum must be blunt, rounded, and smooth. It is to be thoroughly oiled and then carefully pushed through the anus in a slightly upward direction. Pressure upon the bladder will force its contents into the bowel. Much force must be avoided, for the rectum may be lacerated and serious complications or even death result. Exercise will aid the action of the bowels in this and similar colicky troubles, but severe galloping or trotting is to be condemned. If the horse can have a loose box or paddock it is the best, as he will then take what exercise he wants. If the patient be *extremely* violent it is often wise to restrain him, since rupture of the stomach or displacement of the bowels may result and complicate the troubles.

Flatulent colic—Tympanites—Wind colic—Bloat.—Among the most frequent causes of this form of colic are to be mentioned sudden changes of food, too long fasting and food then given while the animal is exhausted, new hay or grain, large quantities of green food, food that has lain in the manger for some time and become sour, indigestible food, irregular teeth, crib-biting, and in fact anything that produces indigestion may produce flatulent colic.

The *symptoms* of wind colic are not so suddenly developed, nor so severe as those of cramp colic. At first the horse is noticed to be dull, paws slightly, may or may not lie down. The pains from the start are continuous. The belly enlarges, and by striking it in front of the haunches a drum-like sound is elicited. If not soon relieved the above symptoms are aggravated, and in addition we notice difficult breathing, profuse perspiration, trembling of anterior limbs, sighing respiration, staggering from side to side, and, finally, plunging forward dead. The diagnostic symptom of flatulent colic is the distention of the bowels with gas, detected by the bloated appearance and resonance on percussion.

The *treatment* for wind colic differs very materially from that of cramp colic. Alkalines neutralize the gases formed, and must be promptly given. Probably as good a domestic remedy as can be had is baking-soda, in doses of from 2 to 4 ounces. If this fails, give chloride of lime in half-ounce doses, or the same quantity of carbonate of ammonia every half hour until relieved. Absorbents are also of service, and we may give charcoal in any quantity. Relaxants and antispasmodics are also beneficial in this form of colic. Chloral hydrate not only possesses these qualities, but it also is an anti-ferment and a pain-reliever. It is then particularly well adapted in the treatment of wind colic, and should be given in the same sized doses and in the manner directed for spasmodic colic.

A physic should always be given in flatulent colic as early as possible, the best being Barbadoes aloes in the dose already mentioned. Injections, per rectum, of turpentine 1 to 2 ounces, linseed-oil 8 ounces, may be given frequently to stimulate the peristaltic motion of the bowels and favor the escape of wind. Blankets wrung out of hot water do much to afford relief; they should be renewed every 5 or 10 minutes and covered with a dry woolen blanket. This form of colic is much more fatal than cramp colic, and requires prompt and persistent treatment. It is entirely unsafe to predict the result, some apparently mild attacks going on to speedy death, while others that appear at the onset to be very severe yielding rapidly to treatment. Do not cease your efforts until you are *sure* the animal is dead. I was called, in one instance, and on reaching my patient the owner informed me that "the horse had just died." The heart, however, was still beating, and by energetic measures (tapping, etc.) I "brought him back to life," as the onlookers asserted. In these severe cases puncturing of the bowels in

the most prominent (distended) part by means of a small trocar and canula, or with the needle of a hypodermic syringe, thus allowing the escape of gas, has often saved life, and such punctures are not followed by any bad results in the majority of instances.

Impaction of the large intestines.—This is a very common bowel trouble and one which, if not promptly recognized and properly treated, results in death. It is caused mostly by overfeeding, especially of grain, and I have noticed that it is much more common where rye is fed alone, or with other grains; old, dry, hard hay, or stalks when largely fed; deficiency of secretions of the intestinal tract, lack of water, want of exercise, paralysis of nerve endings, medicines, etc.

Symptoms.—Impaction of the large bowels is to be diagnosed by a slight abdominal pain, which may disappear for a day or two to reappear with more violence. The feces is passed somewhat more frequently, but in smaller quantities and more dry; the abdomen is full, but not distended with gas; the horse at first is noticed to paw and soon begins to look back at his sides. Probably one of the most characteristic symptoms is the position assumed when down. He lies flat on his side, head and legs extended, occasionally raising his head to look toward his flank; he remains on his side for from five to fifteen minutes at a time. Evidently this position is the one giving the most freedom from pain. He rises at times, walks about the stall, paws, looks at his sides, backs up against the stall which he presses with his tail, and soon lies down again, assuming his favored position. The bowels have ceased entirely to move. The pulse is but little changed at first, being full and sluggish; later, if this condition is not overcome, it becomes rapid and feeble. I have known horses to suffer from impaction of the bowels for a week, yet eventually recover, and others have reported cases extending two or even three weeks which ended favorably. As a rule, however, they seldom last over four or five days, many, in fact, dying sooner than this.

The *treatment* consists of efforts to produce movement of the bowels, and to prevent inflammation of the same from arising. A large cathartic is to be given as early as possible; either of the following are recommended: Powdered Barbadoes aloes 1 ounce, calomel 2 drams, and powdered nux vomica 1 dram; or linseed oil 1 pint, and croton oil 15 drops. Some favor the administration of Epsom salts, 1 pound, with one-quarter pound of common salt, claiming that this causes the horse to drink largely of water, and thus mechanically softening the impacted mass and favoring its expulsion. Whichever physic is selected it is essential that you give a *full* dose. This is much better than small and repeated doses. It must be borne in mind that horses require about twenty-four hours in which to respond to a physic, and under no circumstances are physics to be repeated sooner than this. If aloes has been given and has failed to operate at the proper time, oil or some different cathartic should then be administered. Allow the horse all the water he will drink. The action of the physic may be aided by giving,

every three or four hours, one-half ounce of tincture of belladonna, or one half dram of powdered nux vomica. Copious enemas are to be given every hour, and should be varied; giving first soapy water, then salt and water, or the emulsions of turpentine already alluded to in describing other diseases of the bowels. Enemas of glycerine, 2 to 4 ounces, are often beneficial. Rubbing or kneading of the abdominal walls, the application of stimulating liniments or strong mustard water will also, at times, favor the expulsion of this mass. Walking exercise must occasionally be given. If this treatment is faithfully carried out from the start the majority of cases will terminate favorably. Where relief is not obtained inflammation of the bowels may ensue, and death follow from this cause.

Constipation or costiveness is often witnessed in the horse, and particularly in the foal. Many colts die every year from failure on the part of the attendant to note the condition of the bowels soon after birth. Whenever the foal fails to pass any feces, and in particular if it presents any signs of colicky pains—straining, etc.—*immediate* attention must be given it. As a rule, it will only be necessary to give a few injections of soapy water in the rectum and to introduce the finger through the anus to break down any hardened mass of dung found there. If this is not effective, a purgative must be given. Oils are the best for these young animals, and I mostly select castor oil, giving from 2 to 4 ounces. The foal should always get the first of the mother's milk, as this milk, for a few days, possesses decided laxative properties. If a mare, while suckling, is taking laudanum or similar medicines, the foal should be fed during this time by hand and the mare milked upon the ground. Constipation in adult horses is mostly the result of long feeding on dry, innutritious food, deficiency of intestinal secretions, scanty water supply, or lack of exercise. If the case is not complicated with colicky symptoms, a change to light, sloppy diet, linseed gruel or tea, with plenty of exercise, is all that is required. If colic exists a cathartic is needed. In very many instances the constipated condition of the bowels is due to lack of intestinal secretions, and when so due, must be treated by giving fluid extract of belladonna three times a day in 2-dram doses, and handful doses daily of Epsom salts in the feed.

ALIMENTARY CONCRETIONS—GASTRIC AND INTESTINAL.

Gastric concretions, calculi (stones) in the stomach.—There are probably but few symptoms exhibited by the horse that will lead us to suspect the presence of gastric calculi, and possibly none by which we can unmistakably assert their presence. Stones in the stomach have been most frequently found in miller's horses. A small piece of the mill-stone or other foreign body may serve as a nucleus around which is deposited in layers the calcareous substances which abound in their feed (the sweepings of the mill floor, mixed with good food). I have noticed, and it is generally recorded by veterinary writers, that a depraved and

capricious appetite is common in horses that have a stone forming in their stomach. There is a disposition to eat the wood work of the stable, earth, and, in fact, almost any substance within their reach. This symptom must not, however, be considered as pathognomonic, since it is observed when calculi are not present. Occasional colics may result from these "stomach stones," and when these lodge at the outlet of the stomach they may give rise to symptoms of engorged stomach, already described. I remember one instance in which I found a stone that weighed nearly 4 pounds in the stomach of a horse.

The position that seems to afford the most relief to the afflicted animal is sitting upon the haunches. Constipation may or may not be present. From all this we may conclude that there is reason to suspect the presence of stone in the stomach, if there is a history of depraved appetite; repeated attacks of colic (and particularly if these have recovered *abruptly*); and the position sought by the horse while suffering—sitting on the haunches, or standing with the front feet upon some elevation. During the fatal attack the symptoms are simply those of obstruction, followed by those of inflammation and gangrene, and are not diagnostic. There is, of course, no *treatment* that will prove effective. We can simply give remedies to move the bowels, to relieve pain, and to combat inflammation.

Intestinal concretions, calculi (stones) in the intestines.—These concretions are found mostly in the large bowels, though they are occasionally met with in the small intestines. They are of various sizes, weighing from 1 ounce to 25 pounds; they may be single or multiple, and differ in composition and appearance, some being soft (composed mostly of animal or vegetable matter), while others are porous or honey-combed (consisting of animal and mineral matter), and others again that are entirely hard and stone-like. The hair-balls, so common to the stomach and intestines of cattle, are very rare in the horse. Intestinal calculi form around some foreign body as a rule, mostly a nail, piece of wood, or something of this description, whose shape they assume to a certain extent. Layers are arranged concentrically around such nucleus until the sizes above spoken of are formed. These stones are also often found in millers' horses, as well also as horses in limestone districts where the water is hard. When the calculi attain a sufficient size and become lodged or blocked in some part of the intestines, they cause obstruction, inflammation of the bowels, colicky symptoms, and death. Some veterinarians pretend to diagnose the presence of these bodies during life, but I know of no certain signs or symptoms that reveal them. Recurring colics and character of food and water may enable us to make a good guess at times, but nothing more.

The *symptoms* will be those of obstruction of the bowels. Upon *post-mortem* examinations we will discover these stones, mostly in the large bowels; the intestines will be inflamed or gangrenous about the point of obstruction. Sometimes calculi have been expelled by the action

of a physic, or they may be removed by the hand when found to occupy the last gut.

Treatment.—As in concretions of the stomach, there can be but little done more than to overcome spasm (if any exists), and to give physics with the hope of dislodging the stone or stones and carrying them on and outward.

Intussusception or Invagination is the slipping of a portion of the intestine into another portion immediately adjoining, like a partially turned glove finger. This may occur at any part of the bowels, but is most frequent in the small guts. The invaginated portion may be slight—2 or 3 inches only—or extensive, measuring as many feet. Treves, who has written a most valuable work on intestinal obstruction in man, may be quoted in substance, to some extent. He cautions us not to confound what he classes as "obstructive intussusception" with intussusception of the dying. This latter is often seen upon *post-mortem* examination of children, or with us in young colts. These invaginations occur shortly before death, and are due to irregular contractions of the bowels that take place during the act of dying. Muscular actions are, at this time, irregular and tumultuous, and it is not surprising that intussusception is produced. "Intussusceptions of the dying" are characterized by the following peculiarities: They are small, free from any trace of congestion, inflammation, or adhesion, and can very easily be reduced by slight traction; they are apt to be multiple, and are most frequently directed forward. In obstructive intussusception, on the other hand, the inturned bowel is in the direction of the anus. There are adhesions of the intestines at this point, congestion, inflammation, or even gangrene.

Causes of invagination.—This accident is most likely to occur in horses that are suffering from spasm of the bowel or in those where a small portion of the gut is paralyzed. The natural worm or ring-like contraction of the gut favors the passage of the contracted or paralyzed portion into that immediately behind it. It may occur during the existence of almost any abdominal trouble, as diarrhea, inflammation of the bowels, or from injuries, exposure to cold, etc.

Symptoms.—Unless the invaginated portion of the gut becomes strangulated, probably no symptoms will be appreciable, except constipation. Strangulation of the bowel may take place suddenly, and the horse die within twenty-four hours, or it may occur after several days, a week even, and death follow at this time. There are no symptoms positively diagnostic. Colicky pains, more or less severe, are observed, and there are no, or but few, passages of dung. I have observed *severe straining* in some instances of intussusception, and this should be given due credit when it occurs. As death approaches the horse sweats profusely, sighs, presents an anxious countenance, the legs and ears become cold, and there is often freedom from pain immediately before death. In some rare instances the horse recovers, even though the invaginated portion of

the gut has become strangulated. The imprisoned portion here sloughs away so gradually that a union has taken place between the intestines at the point where one portion has slipped into that behind it. The piece sloughing off is found passed with the manure. Such cases are exceedingly rare, but their possibility should guide us in our treatment. Cathartic medicines are more calculated to do harm than good. We should treat with anodynes and anti-spasmodics, chloral hydrate, laudanum, and sulphuric ether, and medicines to prevent inflammation. Some practitioners favor the administration of powdered opium, 1 to 2 drams, every three or four hours. Injections of salt and water or emulsions of turpentine are given with the somewhat fanciful idea of producing peristalsis of the intestines in a direction opposite to the normal one, *i. e.*, contraction from the anus forward. If this can be produced by these or any other means, it will prove a valuable adjunct to other treatment. Soft feed and mucilaginous and nourishing drinks are to be given during these attacks.

Volvulus, Gut-tie or Twisting of the Bowels.—These are the terms applied to the bowels when twisted or knotted. This accident is rather a common one, and frequently results from the violent manner in which a horse throws himself about when attacked by spasmodic colic. The *symptoms* are the same as those of intussusception and obstructions of the bowels; the same directions as to treatment are therefore to be observed.

Diarrhea is due to eating moldy or musty food, drinking stagnant water, diseased condition of the teeth, eating irritating substances, to being kept on low, marshy pastures, and exposure during cold nights, low, damp stables, or to some morbid or inflammatory condition of the intestinal canal or some of its annexed organs. It is more frequently a symptom of functional disorder than an organic disease. Some horses are predisposed to scour and are called "washy" by horsemen; they are those of long bodies, long legs, and narrow, flat sides. Horses of this build are almost sure to scour if fed or watered immediately before being put to work. Fast or road work, of course, aggravates this trouble. Diarrhea may exist as a complication of other diseases, as pneumonia and influenza for instance, and again during the diseases of the liver.

The *symptoms* are the frequent evacuations of liquid stools, with or without pronounced abdominal pain, loss of appetite, emaciation, etc.

Treatment is at times very simple, but requires the utmost care and judgment. If due to faulty food or water it is sufficient to change these. If it results from some irritant in the intestines, this is best gotten rid of by the administration of an oleaginous purge, the diarrhea mostly disappearing with the cessation of the operation of the medicine. If, however, purging continues, it may be checked by giving wheat flour in water, starch water, white-oak bark tea, chalk, opium, or half-dram doses of sulphuric acid in one-half pint of water twice or thrice daily.

I have good results from powdered opium, 2 drams, and subnitrate of bismuth, 1 ounce, repeated three times a day. One-quarter pound doses of the "Thompsonian composition," to which may be added 1 ounce of baking soda, given two or three times a day, are frequently effective. It should be remembered in all cases to look to the water and feed the horse is receiving. If either of these is at fault they are at once to be discontinued. We should feed sparingly of good, easily digested foods. In that peculiar build of nervous horses that scour on the road but little can be done, as a rule. They should be watered and fed as long as possible before going on a drive. If there is much flatulency accompanying diarrhea, baking soda or other alkaline medicines often produce a cure, while if the discharges have a very disagreeable odor, this can be corrected by 1 ounce of sulphite of soda or half-dram doses of carbolic acid in water, repeated twice a day. Be slow to resort to either the vegetable or mineral astringents, since the majority of cases will yield to change of food and water, or the administration of oils. Afterwards feed upon wheat-flour gruel or other light foods. The body should be warmly clothed.

Superpurgation.—This is the designation of that diarrhea or flux from the bowels that, at times, is induced by and follows the action of a physic. It is accompanied by much irritation or even inflammation of the bowels, and is always of a serious character. Although in rare instances it follows from a usual dose of physic and where every precaution has been taken, it is most likely to result under the following circumstances: Too large a dose of physic; to giving physics to horses suffering from pneumonia, influenza, or other debilitating diseases; to riding or driving a horse when purging; to exposure or draughts of cold air, or giving large quantities of cold water while the physic is operating. There is always danger of superpurgation if a physic is given to a horse suffering from diseases of the respiratory organs. Small and often-repeated physics are also to be avoided, as they produce debility and great depression of the system and predispose to this disorder. When a physic is to be given we should give the horse sloppy food until the medicine begins to operate; we must clothe the body with a warm blanket; keep out of draughts; give only chilled water in small quantities. After a horse has purged from twelve to twenty-four hours it can mostly be stopped or "set," as horsemen say, by feeding on dry oats and hay. Should the purging continue, however, it is best treated by giving demulcent drinks—linseed tea, oatmeal or wheat-flour gruel. After this the astringents spoken of for diarrhea may be given. Besides this the horse is to receive brandy in doses of from 2 to 4 ounces, with milk and eggs, four or five times a day.

Laminitis "founder" is a frequent sequelæ of superpurgation and is to be guarded against by removing the shoes and standing the horse on moist sawdust or some similar bedding.

Dysentery—Williams defines dysentery, or bloody flux, as an intes-

tinal inflammatory action of a peculiar or specific character, attended with fever, occasional abdominal pain, and fluid alvine discharges, mingled with blood or albuminous materials; the tissue changes, which are usually regarded as special, being situated chiefly in the minute gland structures and inter-connective tissue of the large intestine, and of an ulcerative or gangrenous character. To be plainer, dysentery is characterized by coffee-colored or bloody discharges, liquid, and very offensive in odor, and passed with much tenesmus (straining). It is very rare in the horse.

Causes.—Probably the most common cause is keeping young horses in particular for a long time on low, wet, marshy pastures, without other feed (a diarrhea of long standing sometimes terminates in dysentery); exposure during cold, wet weather; decomposed foods; stagnant water that contains large quantities of decomposing vegetable matter; low, damp, and dark stables, particularly if crowded; the existence of some disease, as tuberculosis of the abdominal form.

Symptoms.—The initial symptom is a chill, which probably escapes notice in the majority of instances. The discharges are offensive and for the most part liquid, although it is common to find lumps of solid fecal matter floating in this liquid portion; shreds of mucous membrane and blood are passed, or the evacuations may be muco-purulent; there is much straining, and, rarely, symptoms of abdominal pain; the horse lies down a great deal; the pulse is quickened and the temperature elevated. The appetite may remain fair, but in spite of this the horse rapidly loses flesh and becomes a sorry-looking object. Death rarely follows under two to three weeks. Thirst is a prominent symptom.

Treatment.—This is most unsatisfactory, and I am inclined to place more dependence upon the care and feed than any medication that may be adopted. First of all the horse must be placed in a dry, warm, yet well-ventilated stable; the skin is to receive attention by frequent rubbings of the surface of the body, with blankets, and bandages to the legs. The water must be pure and given in small quantities; the food, that which is light and easily digested. Medicinally, we must give at first a light dose of castor oil, about one-half pint, to which has been added 2 ounces of laudanum. The vegetable or mineral astringents are also to be given. Starch injections containing laudanum often afford great relief. The strength must be kept up by milk punches, eggs, beef tea, oat-meal gruel, etc. In spite of the best care and treatment, however, dysentery mostly proves fatal.

Hæmorrhoids—Piles.—These are rare in horses, although more frequently met with than most people suppose. They are diagnosed by the appearance of bright-red irregular tumors after defecation, which may remain visible at all times or be seen only when the horse is down or after passing his manure. They are mostly due to constipation, to irritation or injuries, or follow from the severe straining during dysentery. I have observed them to follow from severe labor pains in the mare.

Treatment.—Attention must be paid to the condition of the bowels; they should be soft, but purging is to be avoided. The tumors should be washed in warm water and thoroughly cleansed, after which we must scarify them and gently but firmly squeeze out the liquid that will be seen to follow the shallow incisions. While this treatment may be considered as heroic, to say the least, by medical practitioners, yet it has invariably proven successful in my experience, no bad results following. After thus squeezing these tumors and before replacing through the anus, bathe the parts with some anodyne wash. I prefer for this purpose the glycerite of tannin and laudanum in equal parts. Mucilaginous injections into the rectum may be of service for a few days.

Enteritis is an inflammation of the mucous-membrane lining the bowels. This inflammation may extend and involve the muscular or even serous coats. From my observations enteritis is exceedingly rare in the horse unless caused by irritants or corrosive poisons, or following from invagination, twisting of the bowels, etc. In fact, I can not remember ever to have seen but one case of enteritis apart from these or similar causes. It is claimed, however, by some that enteritis may be produced by drinking when warm large quantities of cold water, driving through deep streams when the animal is heated, washing the entire surface of the body at such a time, and by feeding moldy or musty foods, or keeping the horse in damp cellar stables.

Symptoms.—Febrile symptoms, from the onset, mark all attacks of idiopathic enteritis. The membranes of the nose, mouth, and eyes are congested and reddened, the mouth is hot and dry, respirations are increased, the pulse is hard and rapid, temperature is elevated to 103° or 105° Fah. Colicky pains are continuous. The horse walks about the stall, paws, lies down carefully, and most frequently turns himself upon his back by the side of the stall and remains in this position for some time. Thirst is present. As a rule, the bowels are sluggish or even entirely inactive, but when this disease is due to irritant foods or medicines purging and tympanites may be present. The inflammatory pulse, high temperature, continuous pain, which is increased upon pressure, position of the horse when down, coldness of ears and legs, etc., will enable us to diagnose a case of enteritis. Where enteritis follows as a complication of diseases before described, the symptoms will depend upon the character of the original intestinal disorder.

Treatment.—We must rely almost wholly upon opium internally. Give 1 or 2 drams of powdered opium every three or four hours. One dram of extract of belladonna should be added to the above doses of opium. Calomel in 1-dram doses twice a day is also recommended. As a rule, purgatives and enemas are not to be given; our object is to keep the bowels as quiet as possible. Hot blankets applied to the belly, or counter-irritants to abdominal walls, are advisable. Give mucilaginous drinks, as linseed tea, oatmeal gruel, and starch water. Avoid all solid foods that are in the least hard, dry, and indigestible.

If, when the symptoms of inflammation subside, the bowels do not act, try to encourage this by means of walking exercise and injections per rectum. Should these fail a mild cathartic is indicated.

Another form of disease, described by some as enteritis, by others as *muco-enteritis* and "*apoplexy of the large bowels*," is much more common. It is perhaps the most rapidly fatal of all bowel diseases, and is seen most frequently in heavy draught horses. Its causes are hard to determine, but it may follow exposure to cold storms, immersing the body in cold water, and in fact about the same causes that produce true enteritis. In this disease we find in the large bowels mostly an extensive effusion or extravasation of blood between the mucous and muscular coats, giving a bluish or black color. The intestinal walls are thickened by this effusion and sometimes measure from 2 to 3 inches in thickness,

The *symptoms* are severe and persistent pain, labored respiration. rapid and *weak* pulse, profuse perspiration, and paleness of the visible mucous membranes. A peculiar, anxious-expression exists that, once seen, is almost diagnostic. Toward the last the horse sighs, breathes stertorously, staggers and pitches about, and dies in a state of delirium. They rarely live more than ten or twelve hours, and often die inside of six hours.

Treatment.—This is of but little avail, since the case has mostly made great progress before being seen. Probably the best domestic remedy is white-oak bark tea given in large and frequently repeated doses. Tannic acid, 1 dram, or fluid extract of ergot, 1 ounce, are preferable, if at hand, and can be given every half hour until four or five doses have been taken. Hot applications to the body—blankets wrung out of hot water and sprinkled with turpentine—are to be applied frequently. Mustard water should be applied with smart friction to the legs. Could we see these cases at their inception general blood-letting might prove of service.

Hernia.—There are several different kinds of herniæ that require notice at this point, not all of which, however, produce any serious symptoms or results. Abdominal hernia or ruptures are divided into *reducible*, *irreducible*, and *strangulated*, according to condition; and into *inguinal*, *scrotal*, *ventral*, *umbilical* and *diaphragmatic*, according to their situation. A hernia is *reducible* when it can be easily returned into the abdomen. It consists of a soft swelling, without heat, pain, or any uneasiness, generally larger after a full meal, and decreases in size as the bowels become empty. An *irreducible* hernia is one that can not be returned into the abdomen, and yet does not cause any pain or uneasiness. *Strangulated* hernia is one where the contents of the sac are greatly distended, or where from pressure upon the blood-vessels of the imprisoned portion the venous circulation is checked or stopped, thereby causing extensive congestion, swelling, inflammation, and, if not relieved, gangrene of the part and death of the animal. Hernia may be congenital and accidental or acquired.

Congenital scrotal hernia.—Not a few foals are noticed from birth to have an enlarged scrotum, which gradually increases in size up to about the sixth month, sometimes longer. In some instances I have noticed the scrotum of a six-months-old colt to be as large as that of an adult stallion, and have been repeatedly asked to prescribe treatment for it. This is entirely unnecesary in ninety-nine out of every hundred cases, as this enlargement entirely disappears by the time the colt has reached his second year. Any interference, medicinal or surgical, is worse than useless. If the intestine contained within the scrotum should at any time become *strangulated*, it must then be treated the same as in an adult horse.

Scrotal hernia is caused by dilatation of the sheath of the testicle, combined with relaxation of the fibrous tissue surrounding the inguinal ring, thus allowing the intestine to descend to the scrotum. At first this is intermittent, appearing during work and returning when the horse is at rest. For a long time this form of hernia may not cause the least uneasiness or distress. In course of time, however, the imprisoned gut becomes filled with feces, its return into the abdominal cavity is prevented, and it soon becomes strangulated. While the gut is thus filling the horse often appears dull, is disinclined to move, appetite is impaired, and there is rumbling and obstruction of the bowels. Colicky symptoms now supervene. I do not wish to imply that strangulation and its consequent train of symptoms *always* follows in scrotal hernia, as I know of an old horse where the scrotum, by weight of the contained gut, forms a pendulous tumor reaching half way to the hock, and yet he has never experienced any serious inconvenience.

Inguinal hernia is but an incomplete scrotal hernia, and, like the latter, may exist and cause no signs of distress, or again it may become strangulated and cause the death of the animal. Inguinal hernia is seen mostly in stallions, next in geldings, and very rarely in the mare. Bearing in mind that *scrotal hernia* is seen only in horses, we can proceed to detail the *symptoms* of both strangulated, inguinal, and scrotal hernia at the same time. When, during the existence of colicky symptoms, we find a horse kicking with his hind feet while standing, or lying upon his back, we should look to the inguinal region and scrotum. If scrotal hernia exists the scrotum will be enlarged and lobulated; by pressure we may force a portion of the contents of the gut back into the abdomen, eliciting a gurgling sound. If we take a gentle but firm hold upon the enlarged scrotum and then have an assistant cause the horse to cough, the swelling will be felt to *expand* and as quickly *contract* again.

The history of these cases will materially aid us, as the owner can often assure us of preceding attacks of "colic," more or less severe, that have been instantaneously relieved in some (to him) unaccountable manner. The colicky symptoms of these herniæ are not *diagnostic*, but, probably, more closely resemble those of enteritis than any other

bowel diseases. Cold sweats, *particularly of the scrotum and thighs*, are held by some writers to be pathognomonic.

The diagnosis can, in many cases, only be made by a veterinarian, when he has recourse to a rectal examination; the bowels can here be felt entering the internal abdominal ring. If the reader can be sure of the existence of these herniæ, he should secure the horse upon its back, and, with a hand in the rectum, endeavor to catch hold of the wandering bowel and pull it gently back into the cavity of the abdomen. Pressure should be made upon the scrotum during this time. I once succeeded in reducing a strangulated scrotal hernia, after having cast the animal, by keeping a bag of cracked ice upon the scrotum, thus condensing the imprisoned gases and causing contraction of the swelling. If these means fail a veterinarian must be called to reduce the hernia by means of incising the inguinal ring, replacing the intestines, and castrate, using clamps and performing the "covered operation."

Ventral hernia.—In this form of hernia the protrusion is through some accidental opening or rupture of some of the abdominal coats or coverings. It may occur at any part of the belly except at the umbilicus, and is caused by kicks, blows, hooks, severe jumping or pulling, etc. Ventral hernia is most common in pregnant mares, and is here due to the weight of the fœtus or some degenerative changes taking place in the abdominal coats. It is recognized by the appearance of a swelling, at the base of which can be felt the opening or rent in the abdominal tunics, and from the fact that the swelling containing the intestines can be made to disappear when the animal is placed in a favorable position.

Treatment.—In many instances there is no occasion for treatment, and again, where the hernial sac is extensive, treatment is of no avail. If the hernia is small we may attempt a cure by the methods to be described in treating of umbilical hernia. If we are fortunate enough to be present when the hernia occurs, and particularly if it is not too large, we may, by the proper application of a pad and broad bandage, effect a perfect cure.

Umbilical hernia is the passing of any portion of the bowel or omentum through the navel, forming a "tumor" at this point. This is often congenital in our animals, and is due to the imperfect closure of the umbilicus and to the position of the body. Many cases of umbilical hernia, like inguinal and scrotal of the congenital kind, disappear entirely by the time the animal reaches its second or third year. Advancing age favors cure in these cases from the fact that the omentum (swinging support of the bowels) is proportionally shorter in adults than in foals, thus lifting the intestines out of the hernial sac and allowing the opening in the walls to close. Probably one of the most frequent causes of umbilical hernia in foals is the practice of keeping them too long from their dams, causing them to fret and worry, and to neigh or cry by the hour. The contraction of the abdominal muscles

and pressure of the intestines during neighing seem to open the umbilicus and induce hernia. Accidents may cause umbilical hernia in adults in the same manner as ventral hernia is produced, though this is very rare.

Treatment.—The treatment of umbilical hernia varies much with different practitioners. We should remember the fact that congenital herniæ are often removed with age, but probably congenital *umbilical* herniæ less frequently than others. Among the many plans of treatment are to be mentioned the application of a pad over the tumor, the pad being held in place by a broad, tight bandage placed around the animal's body. The chief objection to this is the difficulty in keeping the pad in its place. Blisters are often applied over the swelling, and as the skin hardens and contracts by the formation of scabs an artficial bandage or pressure is produced that at times is successful. Another treatment that has gained considerable repute of late years consists in first clipping off the hair over the swelling. Nitric acid is then applied by a small brush, using only enough to moisten the skin. This sets up a deep-seated adhesive inflammation, which, in very many cases, closes the opening in the navel. Still another plan is to inject a solution of common salt by means of the hypodermic syringe at three or four points about the base of the swelling. This acts in the same manner as the preceding, but in my experience is not as effectual.

Others again, after keeping the animal fasting for a few hours, cast and secure it upon its back; the bowel is then carefully returned into the abdomen. The skin over the opening is to be pinched up and one or two skewers are to be run through the skin from side to side as close as possible to the umbilical opening. These skewers are kept in place by passing a cord around the skin between them and the abdomen and securely tied. Great care must be taken not to draw these cords *too tight*, as this would cause a speedy slough of the skin, the intestines would extrude, and death result. If properly applied an adhesion is established between the skin and the umbilicus which effectually closes the orifice.

Diaphragmatic hernia.—This consists of the passage of any of the abdominal viscera through a rent in the diaphragm (midriff) into the cavity of the thorax. It is rather a rare accident and one often impossible to diagnose during life. Colicky symptoms, accompanied by great difficulty in breathing, and the peculiar position so often assumed (that of sitting upon the haunches) are somewhat characteristic of this trouble, though these symptoms, as we have already seen, may be present during diseases of the stomach or anterior portion of the bowels. Even could we pronounce, with certainty, this form of hernia, there is little or nothing that can be done. Leading the horse up a very steep gangway or causing him to rear up may possibly cause the hernial portion to return to its natural position. This is not enough, however; it must be kept there.

Peritonitis is an inflammation of the serous membrane lining the cavity of and covering the viscera contained within the abdomen. It is very rare to see a case of idiopathic peritonitis. It is, however, somewhat common from extension of the inflammatory action involving organs covered by the peritoneum. Peritonitis is often caused by injuries, as punctured wounds of the abdomen, severe blows or kicks, or, as is still more common, following the operation of castration. It follows frequently from strangulated herniæ, invagination, rupture of the stomach, intestines, liver, or womb.

Symptoms.—Peritonitis is mostly preceded by a chill; the horse is not disposed to move, and if compelled to do so, moves with a stiff or sore gait; he paws with the front feet, and probably strikes at his belly with the hind ones; lies down very carefully, and as the pain is increased while down, he maintains during most of the time the standing position; he walks uneasily about the stall. Constipation is usually present. Pressure on the belly causes acute pain, and the horse will bite, strike, or kick at you if so disturbed; the abdomen is tucked up; the extremities fine and cold. The temperature is higher than normal, reaching from 102° to 104° Fah. The pulse in peritonitis is almost, of itself, diagnostic; it is quickened, beating from seventy to ninety beats per minute, and is *hard* and *wiry*. This peculiarity of the pulse is characteristic of inflammation of the serous membrane, and if occurring with colicky symptoms, and, in particular, if following any injuries, accidental or surgical, of the peritoneum, we may rest assured that peritonitis is present. Peritonitis in the horse is mostly fatal when it is at all extensive. If death does not occur in a short time, the inflammation assumes a chronic form, in which there is an extensive effusion of water in the cavity of the belly, constituting what is known as ascites, and which, as a rule, results in death.

The *treatment* of peritonitis is to be somewhat like that of enteritis. Opium in powder, 1 to 2 drams, with calomel, one-half dram, is to be given every two, three, or four hours, and constitute our main dependence in this disease. Extensive counter-irritants over the belly, consisting of mustard-plasters, turpentine stupes, or even mild blisters, are highly recommended. Purgatives must never be given during this complaint. Should we desire to move the bowels it can be done by gentle enemas, though it is seldom necessary to resort even to this.

Ascites, or dropsy of the abdomen, is mostly seen as a result of subacute or chronic peritonitis, but may be due to diseases of the liver, kidneys, heart, or lungs. There will be found, on opening the cavity of the belly, a large collection of yellowish or reddish liquid; from a few quarts to several gallons may be present. It may be clear in color, though generally it is yellowish or of a red tint, and contains numerous loose flakes of coagulable lymph.

Symptoms.—There is slight tenderness on pressure; awkward gait of the hind legs; the horse is dull, and may have occasional very slight

colicky pains, shown by looking back and striking at the belly with the hind feet. Oftener, however, these colicky symptoms are absent. Diarrhea often precedes death, but during the progress of the disease the bowels are alternately constipated and loose. On percussing the abdominal walls we find that dullness exists *to the same height* on both sides of the belly; by suddenly pushing or striking the abdomen we can hear the rushing or flooding of water. If the case is an advanced one the horse is pot-bellied to the extreme, and dropsical swellings are seen under the belly and upon the legs.

Treatment is, as a rule, unsatisfactory. Saline cathartics, as Epsom or Glauber salts, and diuretics, ounce doses of saltpeter, are to be given. If a veterinarian is at hand he should withdraw the accumulation of water by tapping and should then endeavor to prevent its recurrence (though this is almost sure to follow) by giving three times a day saltpeter, 1 ounce, and iodide of potash, 1 dram, and by the application of mustard or blisters over the abdominal walls. Tonics, mineral and vegetable, are also indicated. Probably the best tonic is one consisting of powdered sulphate of iron, gentian, and ginger in equal parts. A heaping tablespoonful of the mixture is to be given as a drench or mixed with the feed, twice a day. Good nutritious foods and gentle exercise complete the treatment.

DISEASES OF THE LIVER.

This organ in the horse is but rarely the seat of disease, and when we consider how frequently the liver of man is affected, this can not but appear strange to all. There is a difference of the anatomical arrangement of the liver of the horse from that of man that may to some extent account for this rarity of disease in the former. It is very common to hear the would-be veterinarian assert that a horse "has disease of his gall-bladder." He thus displays his ignorance, as the horse has no such biliary reservoir. This absence of the gall-bladder may account to a certain extent for his freedom from liver diseases; as overdistension of this and the presence in it of calculi (stones) in man is a frequent source of trouble. In domestic animals, as in man, hot climates tend to produce diseases of the liver, just as in cold climates lung diseases prevail. Not only are diseases of the liver rare in horses, but they are also very obscure, and in many cases pass totally unobserved until after death. There are some symptoms, however, which, when present, should make us examine the liver as carefully as possible. These are jaundice (yellowness of the mucous membranes of the mouth, nose, and eyes) and the condition of the dung, it being light in color and pasty in appearance.

Hepatitis, inflammation of the liver, may be general or local and may assume an acute or chronic form. The *symptoms* of acute hepatitis are: Dullness; the horse is suffering from some internal pain, but not of a severe type; constipated and clay-colored dung balls, scanty and high-

colored urine, and general febrile symptoms. If lying down he is mostly found on the left side; looks occasionally toward the right side, which, upon close inspection, may be found to be slightly enlarged over the posterior ribs, where pain upon pressure is also evinced. Obscure lameness in front, of the right leg mostly, is said by some of the best veterinary writers to be a symptom of hepatitis. The horse, toward the last, reels or staggers in his gait and falls backward in a fainting fit, during one of which he finally succumbs. Death is sometimes due to rupture of the enveloping coat of the liver or of some of its blood-vessels.

Among the *causes* that lead to this disease we must mention first the stimulating effect of overfeeding, particularly during hot weather. Those horses that are well fed and receive but little exercise—old favorites that are being liberally fed and have passed the time of service, pensioned heroes of years of faithful toil—these are the best subjects for diseases of this organ. We must add to these causes the more mechanical ones, as injuries on the right side over the liver, worms in the liver, gall-stones in the biliary ducts, foreign bodies, as needles or nails that have been swallowed and in their wanderings have entered the liver, and, lastly, in some instances, the extension of inflammation from neighboring parts, thus involving this organ. Acute hepatitis may terminate in chronic inflammation, abscesses, rupture of the liver, or may disappear, leaving behind no trace of disease whatever.

Treatment.—This should consist, at first, of the administration of 1 ounce of Barbadoes aloes or other physic. A large blister is to be applied to the right side, letting it extend from a little behind the girth backward to the last rib and in width about 12 to 14 inches midway between the spine above and the middle of the belly below. General blood-letting, if had recourse to early, must prove of much benefit in acute inflammation of the liver. The vein in the neck—jugular—must be opened, and from 4 to 6 quarts of blood may be drawn. Saline medicines, to act on the kidneys, should follow this treatment; 1-ounce doses of saltpeter or muriate of ammonia, repeated three or four times a day, are probably as good as any. The horse is to be fed sparingly on soft food, bran-mashes chiefly. If we prove successful and recovery takes place, see to it that the horse afterwards gets regular exercise and that his food is not of a highly nutritious character, or excessive.

It will, I think, be useless to attempt much of a description of *chronic hepatitis*, the symptoms of this trouble being so obscure that the veterinary surgeon, in most cases, can scarcely hope to do more than diagnose it by exclusion. True, if a horse has had acute hepatitis and remains dull for too great a length of time, with occasional slight colicky symptoms, yellow membranes, etc., we may not fear of being far wrong in saying that this disease has passed to the chronic form; but to diagnose this form of hepatitis, without any such previous knowledge of the case, is, to tell the truth, very often "guess-work" with us.

Jaundice—Icterus—The Yellows.—This is a condition caused by the retention and absorption of bile into the blood. It was formerly considered to be a disease of itself, but can not, I think, be accepted as more than a symptom, or at most as expressing the existence of functional disorder of the liver. "The Yellows" is observed by looking at the eyes, nose, and mouth, when it will be seen that these parts are yellowish instead of the pale-pink color of health. In white or light-colored horses the skin even may show this yellow tint. The urine is saffron-colored, the dung is of a dirty gray color, and constipation is mostly present. Jaundice may be present as a symptom of almost any inflammatory disease. We know that when an animal is "fevered" the secretions are checked, the bile is retained and absorbed throughout the system, and yellowness of the mucous membranes follows. Jaundice may also exist during the presence of simple constipation, hepatitis, biliary calculi, abscesses, hardening of the liver, etc.

Treatment.—When jaundice exists we must endeavor to rid the system of the excess of bile, and this is best accomplished by giving purgatives that act upon the liver. Calomel, 2 drams, with aloes, 7 drams, should be given. Glauber salts in handful doses once or twice a day for a week is also effective. May-apple, rhubarb, castor oil, and other cathartics that act upon the first or small bowels, may be selected. We must be careful to see that the bowels are kept open by avoiding hard, dry, bulky foods.

Rupture of the liver.—This is known to occur at times in the horse, most frequently in old, fat horses and those that get but little exercise. Horses that have suffered from chronic liver disease for years eventually present symptoms of colic and die quite suddenly. Upon *post-mortem* examination we discover that the liver had ruptured. The cicatrices or scars that are often found upon the liver lead me to think that that organ may suffer *small* rupture and yet the horse recover from it. This result can not obtain, however, if the rent or tear is extensive, since in such cases death must quickly follow from hemorrhage, or, later, from peritonitis. Enlarged liver is particularly liable to rupture, and it is not surprising that, when we read of this organ weighing 55 to 60 pounds, this accident occurs. The immediate causes of rupture appear to be excessive muscular exertion, sudden distention of the abdomen with gas, or some accident, as falling or being kicked by another horse.

The *symptoms* of rupture will depend upon the extent of the laceration. If slight there will be simply the symptoms of abdominal pain, looking back to the sides, lying down, etc.; if extensive the horse is dull and dejected, has no appetite, breathing becomes short and catching, he sighs or sobs, visible mucous membranes are pale, extremities cold, pulse fast, small, and weak or running down. Countenance now shows much distress, he sweats profusely, totters in his gait, props his legs wide apart, reels, staggers, and falls. He may get up again, but soon falls dead. The rapid running-down pulse, paleness of the eyes,

nose, and mouth, sighing, stertorous breathing, tottering gait, etc., are the symptoms by which we know that the animal is dying from internal hemorrhage.

Treatment.—But little can be doue. Opium in powder, in doses of 2 drams every two or three hours, may be given, with the idea of preventing as much as possible all movements of internal organs. If we have reason to suspect internal bleeding we should give large and frequent doses of white-oak bark tea, dram doses of tannic or gallic acid, or the same quantity of sugar of lead, every half hour or hour. Fluid extract of ergot or tincture of the chloride of iron, in ounce doses, may be selected. Cold water dashed upon the right side or injected into the rectum is highly spoken of as a means of checking the hemorrhage.

Biliary calculi.—Gall-stones.—These are rarely found in the horse, but may occupy the hepatic ducts, giving rise to jaundice and to colicky pains. There are no absolutely diagnostic symptoms, but should we find a horse that suffers from repeated attacks of colic, accompanied by symptoms of violent pain, and that during or following these attacks the animal is jaundiced, we may hazard the conjecture that gall-stones are present. There is little or nothing to be done except to give medicines to overcome pain, trusting that these concretions may pass on to the bowels, where, from their small size, they will not occasion any inconvenience.

Diseases of the pancreas and spleen are so rare, or their symptoms so little understood, that it is impossible to write anything concerning either of these organs and their simple diseases that will convey to the reader information from a worthy stand-point, *i. e.*, that of experience and observation. It is sometimes well, even for the veterinarian, to know that he does not know. This knowledge has saved my readers an infliction.

PLATE I.

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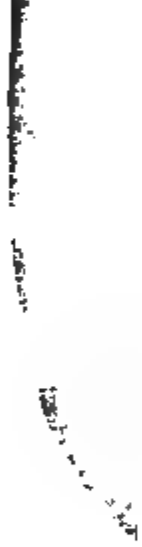
Haines, after Mégnin

DIGESTIVE APPARATUS.

Sackett & Wilhelms Litho Co. N.Y.

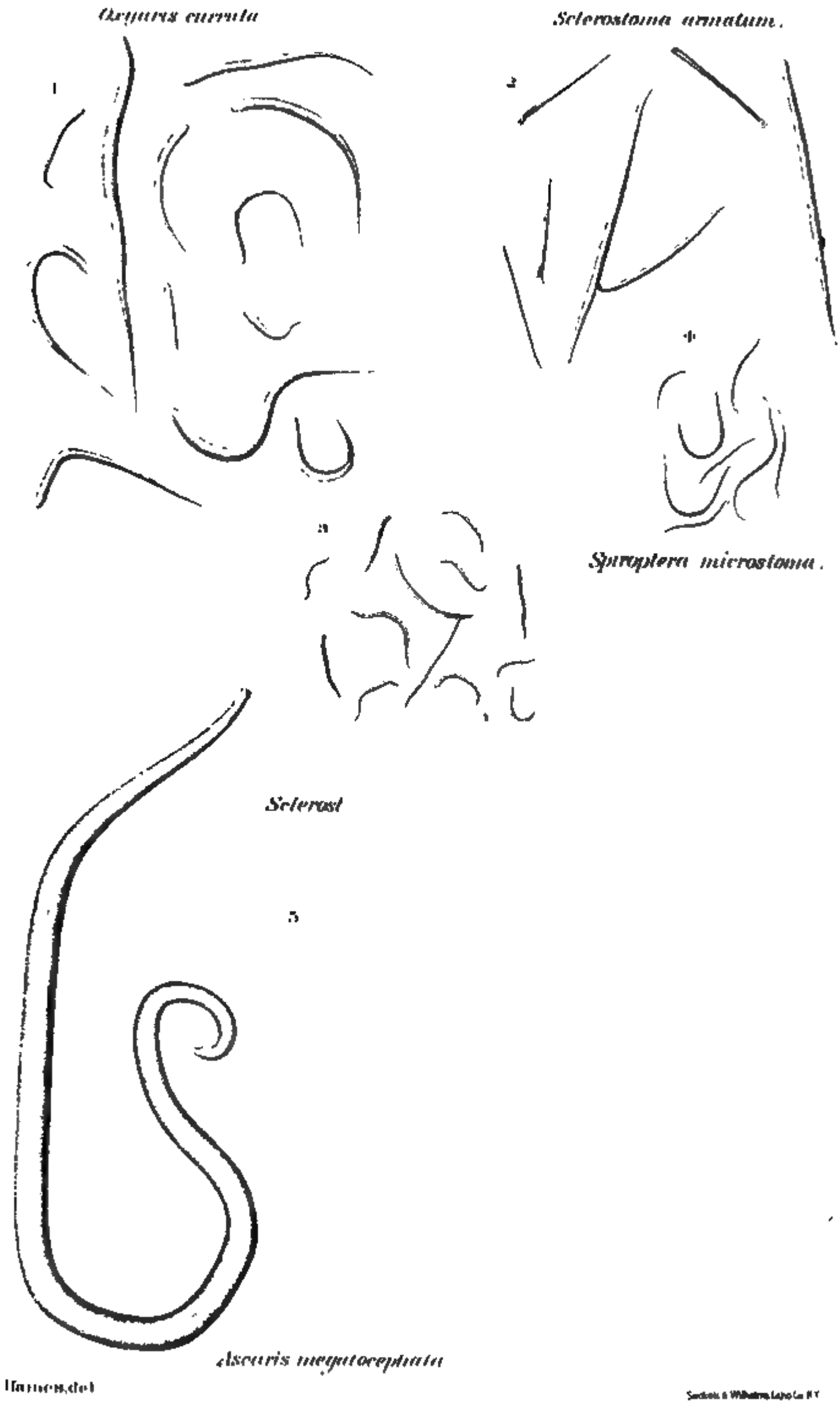


Haines,del.

Sackett & Wilhelms Litho Co. N.Y.

BOTS.
1 Bots in the stomach.
2 Bots in the duodenum.

PLATE III



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Sackett & Wilhelms, Litho. Co. N.Y.

INTESTINAL WORMS.

DISEASES OF THE URINARY ORGANS.

By JAMES LAW, F. R. C. V. S.,
Professor of Veterinary Science, etc., in Cornell University.

The urinary organs constitute the main channel through which are excreted the nitrogenous or albuminoid principles, whether derived directly from the food or from the muscular and other nitrogenized tissues of the body. They constitute, besides, the channel through which are thrown out most of the poisons, whether taken in by the mouth or skin or developed in connection with faulty or natural digestion, blood-forming, nutrition, or tissue destruction; or, finally, poisons that are developed within the body as the result of normal cell-life or of the life of bacteria or other germs that have entered the body from without. To a large extent, therefore, these organs are the sanitary scavengers and purifiers of the system, and when their functions are impaired or arrested the retained poisons quickly show their presence in resulting disorders of the skin and connective tissue beneath it, of the nervous system, or other organs. Nor is this influence one-sided. Scarcely an important organ of the body can suffer derangement without entailing a corresponding disorder of the urinary system. Nothing can be more striking than the mutual balance maintained between the liquid secretions of the skin and kidneys during hot and cold weather. In summer, when so much liquid exhales through the skin as sweat, comparatively little urine is passed, whereas in winter, when the skin is inactive, the urine is correspondingly increased. This vicarious action of skin and kidneys is usually kept within the limits of health, but at times the draining off of the water by the skin leaves too little to keep the solids of the urine safely in solution, and these are liable to crystallize out and form stone and gravel. Similarly the passage in the sweat of some of the solids that normally leave the body, dissolved in the urine, serves to irritate the skin and produce troublesome eruptions. A disordered liver contributes to the production, under different circumstances, of an excess of biliary coloring-matter, which stains the urine; of an excess of hippuric acid and allied products, which, being less soluble than urea (the normal product of tissue change), favor the formation of stone, of taurocholic acid, and other bodies that tend, when

in excess, to destroy the blood globules and to cause irritation of the kidneys by the resulting hæmoglobin excreted in the urine, and of glycogen too abundant to be burned up in the system, which induces saccharine urine (diabetes). Any disorder leading to impaired functional activity of the lungs is causative of an excess of hippuric acid and allied bodies, of oxalic acid, of sugar, etc., in the urine, which irritate the kidneys even if they do not produce solid deposits in the urinary passages. Diseases of the nervous system, and notably of the base of the brain and of the spinal cord, induce various urinary disorders, prominent among which are diabetes, chylous urine, and albuminuria. Certain affections, with imperfect nutrition or destructive waste of the bony tissues, tend to charge the urine with phosphates of lime and magnesia, and endanger the formation of stone and gravel. In all extensive inflammations and acute fevers the liquids of the urine are diminished, while the solids (waste products), which should form the urinary secretion, are increased, and the surcharged urine proves irritant to the urinary organs or the retained waste products poison the system at large.

Diseases of the heart and lungs, by interfering with the free onward flow of the blood from the right side of the heart, tend to throw that liquid back on the veins, and this backward pressure of venous blood strongly tends to disorders of the kidneys. Certain poisons taken with the food and water, notably that found in magnesian limestone and those found in irritant diuretic plants, are especially injurious to the kidneys, as are also various cryptogams, whether present in musty hay or oats. The kidneys may be irritated by feeding green vegetables covered with hoar-frost or by furnishing an excess of food rich in phosphates (wheat bran, beans, pease, vetches, lentils, rape-cake, cotton-seed cake) or by a privation of water which entails a concentrated condition and high density of the urine. Exposure in cold rain or snow storms, cold draughts of air, and damp beds are liable to further disorder an already overworked or irritable kidney. Finally, sprains of the back and loins may cause bleeding from the kidneys or inflammation.

The right kidney, weighing 23½ ounces, is shaped like a French bean, and extends from the loins forward to beneath the heads of the last two ribs. The left kidney (Plate IV), resembles a heart of cards, and extends from the loins forward beneath the head of the last rib only. Each consists of three distinct parts, (*a*) the external (cortical) or vascular part, in which the blood-vessels form elaborate capillary networks within the dilated globular sacs which form the beginnings of the secreting (uriniferous) tubes and on the surface of the sinuous secreting tubes leading from the sacs inward toward the second or medullary part of the organ; (*b*) the internal (medullary) part, made up in the main of blood-vessels, lymphatics, and nerves extending between the notch on the inner border of the kidney to and from the outer vascular portion, in which the secretion of urine is almost exclusively carried on; and

(*d*) a large saccular reservoir in the center of the kidney into which all uriniferous tubes pour their secretions and from which the urine is carried away through a tube *g*, (ureter), which passes out of the notch at the inner border of the kidney and which opens by a valve-closed orifice into the roof of the bladder just in front of its neck. The bladder is a dilatable reservoir for the retention of the urine until the discomfort of its presence causes its voluntary discharge. It is kept closed by circular muscular fibers surrounding its neck or orifice, and is emptied by looped muscular fibers extending in all directions forward from the neck around the blind anterior end of the sac. From the bladder the urine escapes through a dilatable tube (urethra) which extends from the neck of the bladder backward on the floor of the pelvis, and in the male through the penis to its free end, where it opens through a pink conical papilla. In the mare the urethra is not more than an inch in length, and is surrounded by the circular muscular fibers closing the neck of the bladder. Its opening may be found directly in the median line of the floor of the vulva, about 4½ inches from its external opening.

General symptoms.—These apply especially to acute inflammations and the irritation caused by stone. The animal moves stiffly on the hind limbs, straddles, and makes frequent attempts to pass urine, which may be in excess, deficient in amount, liable to sudden arrest in spite of the straining, passed in driblets, or entirely suppressed. Again, it may be modified in density or constituents. Difficulty in making a sharp turn, or in lying down and rising with or without groaning, dropping the back when mounted or when pinched on the loins is suggestive of kidney disease, and so to a less extent are swelled legs, dropsy, and diseases of the skin and nervous system. The oiled hand introduced through the rectum may feel the bladder beneath and detect any over-distension, swelling, tenderness, or stone. In ponies the kidneys even may be reached.

Examination of the urine.—In some cases the changes in the urine are the sole sign of disease. In health the horse's urine is of a deep amber color and has a strong odor. On a feed of grain and hay it may show a uniform transparency, while on a green ration there is an abundant white deposit of carbonate of lime. Of its morbid changes the following are to be looked for: (1) *Color:* White from deposited salts of lime; brown or red from blood clots or coloring matter; yellow or orange from bile or blood-pigment; pale from excess of water, or variously colored from vegetable ingredients (santonin makes it red, rhubarb or senna, brown; tar or carbolic acid, green). (2) *Density:* The horse's urine may be 1.030 to 1.050, but it may greatly exceed this in diabetes and may sink to 1.007 in diuresis. (3) *Chemical re-action*, as ascertained by blue litmus or red test papers. The horse on vegetable diet has alkaline urine turning red test papers blue, while in the sucking-colt and the horse fed on flesh or on his own tissues (in starvation or abstinence during disease) it is acid, turning blue litmus red.

(4) *Organic constituents*, as when glairy from albumen coagulable by strong nitric acid and boiling, when charged with microscopic casts of the uriniferous tubes, with the eggs or bodies of worms, with sugar, blood, or bile. (5) *In its salts*, which may crystalize out spontaneously, or on boiling, or on the addition of chemical re-agents.

Albuminous urine in the horse is usually glairy, so that it may be drawn out in threads, but its presence can always be tested as follows: If the liquid is opaque, it may be first passed through filter paper; if very dense and already precipitating its salts, it may be diluted with distilled water; add to the suspected liquid acetic acid drop by drop until it reddens blue litmus paper; then boil gently in a test tube; if a precipitate is thrown down, set the tube aside to cool and then add strong nitric acid. If the precipitate is not dissolved it is albumen; if dissolved it was probably urate or hippurate of ammonia. Albumen is normally present in advanced gestation; abnormally it is seen in diseases in which there occurs destruction of blood globules (anthrax, low fevers, watery states of the blood, dropsies), in diseases of the heart and liver which prevent the free escape of blood from the veins and throw back venous pressure on the kidneys, in inflammation of the lungs and pleuræ, and even tympany (bloating), doubtless from the same cause, and in all congestive or inflammatory diseases of the kidneys, acute or chronic.

Casts of the uriniferous tubes can only be seen by placing the suspected urine under the microscope. They are usually very elastic and mobile, waving about in the liquid when the cover-glass is touched, and showing a uniform clear transparency (waxy) or entangled circular epithelial cells or opaque granules or flattened red blood globules or clear refrangent oil globules. They may be even densely opaque from crystals of earthy salts.

Pus cells may be found in the urine associated with albumen, and are recognized by clearing up, when treated with acetic acid, so that each cell shows two or three nuclei.

DIURESIS—POLYURIA—DIABETES INSIPIDUS—EXCESSIVE SECRETION OF URINE.

This consists in an excessive secretion of a clear, watery urine of a low specific gravity (1.007) with a correspondingly ardent thirst, a rapidly advancing emaciation, and great loss of strength and spirit.

Its *causes* may be any agent, medicinal, alimentary, or poisonous, which unduly stimulates the kidneys; the reckless administration of diuretics, which form such a common constituent of quack horse-powders; acrid diuretic plants in grass or hay; new oats still imperfectly cured; an excess of roots or other very watery food; a full allowance of salt to animals that have become inordinately fond of it; but, above all, feeding on hay, grain, or bran which has not been properly dried and has become musty and permeated by fungi. Thus hay, straw, or oats secured

in wet seasons and heating in the rick or stack is especially injurious. Hence this malady, like *coma somnolentum* (sleepy staggers), is widespread in wet seasons, and especially in rainy districts.

Symptoms.—The horse drinks deep at every opportunity and passes urine on every occasion when stopped, the discharge being pale, watery, of a low density, and inodorous; in short, it contains a great excess of water and a deficiency of the solid excretions. So great is the quantity passed, however, that the small amount of solids in any given specimen amounts in twenty-four hours to far more than the normal, a fact in keeping with the rapid wasting of the tissues and extreme emaciation. The flanks become tucked up, the fat disappears, the bones and muscles stand out prominently, the skin becomes tense and hidebound, and the hair erect, scurfy, and deficient in luster. The eye becomes dull and sunken, the spirits are depressed, the animal is weak and sluggish, sweats on the slightest exertion, and can endure little. The subject may survive for months, or he may die early of exhaustion. In the slighter cases, or when the cause ceases to operate, he may make a somewhat tardy recovery.

Treatment.—This consists in stopping the ingestion of the faulty drugs, poisons or food, and supplying sound hay and grain free from all taint of heating or mustiness. A liberal supply of boiled flaxseed in the drinking water at once serves to eliminate the poison and to sheath and protect the irritated kidneys. Tonics like sulphate or phosphate of iron (2 drams morning and evening) and powdered gentian or Peruvian bark (4 drams) help greatly by bracing the system and hastening repair. To these may be added agents calculated to destroy the fungus and eliminate its poisonous products. In that form which depends on musty food nothing acts better than large doses of iodide of potassium (2 drams), while in other cases creosote, carbolic acid (1 dram), or oil of turpentine (4 drams) properly diluted, may be resorted to.

SACCHARINE DIABETES—DIABETES MELLITUS—GLYCOSURIA—INOSURIA.

This is primarily a disease of the nervous system or liver rather than of the kidneys, yet, as the most prominent symptom is the sweet urine, it may be treated here. Its *causes* are varied, but resolve themselves largely into disorder of the liver or disorder of the brain. One of the most prominent functions of the liver is the formation of glycogen, a principle allied to grape-sugar, and passing into it by further oxidation in the blood. This is a constant function of the liver, but in health the resulting sugar is burned up in the circulation and does not appear in the urine. On the contrary, when the supply of oxygen is defective, as in certain diseases of the lungs, the whole of the sugar does not undergo combustion and the excess is excreted by the kidneys. Also in certain forms of enlarged liver the amount of sugar produced is more than can be disposed of in the natural way, and it appears in the urine. A tem-

porary sweetness of the urine often occurs after a hearty meal on starchy food, but this is due altogether to the superabundant supply of the sugar-forming food, lasts for a few hours only, and has no pathological significance. In many cases of fatal glycosuria the liver is found to be enlarged, or at least congested, and it is found that the disorder can be produced experimentally by agencies which produce an increased circulation through the liver. Thus Bernard produced glycosuria by pricking the oblong medulla at the base of the brain close to the roots of the pneumogastric nerve, which happens to be also the nerve center (vaso-motor) which presides over the contractions of the minute blood-vessels. The pricking and irritation of this center leads to congestion of the liver and the excessive production of sugar. Irritation carried to this point through the pneumogastric nerve causes saccharine urine, and, in keeping with this, disease of the pancreas has been found in this malady, the irritation being conveyed thence to the brain through the pneumogastric nerve and reflected to the liver through the vaso-motor nerves. The same result follows the reflection of irritation from other sources, as from different ganglia (corpora striata, optic thalami, pons, cerebellum, cerebrum) of the brain. Similarly it is ir duced by interruption of the nervous control along the vaso-motor tracts, as in destruction of the upper or lower cervical sympathetic ganglion, by cutting the nervous branch connecting these two, in injury to the spinal marrow in the interval between the brain and the second or fourth dorsal vertebra, or in disease of the cœliac plexus, which directly presides over the liver. Certain chemical poisons also cause saccharine urine, notably woorara, strychnia, morphia, phosphoric acid, alcohol, ether, chloroform, quinia, ammonia, and arsenic.

The *symptoms* are ardent thirst and profuse secretion of a pale urine of a high density (1.060 and upward), rapid loss of condition, scurfy, unthrifty skin, costiveness or irregularity of the bowels, indigestion, and the presence in the urine of a sweet principle, grape-sugar or inosite, or both. This may be most promptly detected by touching the tip of the tongue with a drop. Sugar may be detected simply by adding a teaspoonful of liquid yeast to 4 ounces of the urine and keeping it lightly stopped at a temperature of 70° to 80° F., for twelve hours, when the sugar will be found to have been changed into alcohol and carbon dioxide. The loss of density will give indication of the amount of sugar transformed; thus a density of 1.035 in a urine which was formerly 1.060 would indicate about 15 grains of sugar to the fluid ounce.

Inosite or muscle-sugar, frequently present in the horse's urine, and even replacing the glucose, is not fermentable. Its presence may be indicated by its sweetness and the absence of fermentation, or by Gallois' test. Evaporate the suspected urine at a gentle heat almost to dryness, then add a drop of a solution of mercuric nitrate and evaporate carefully to dryness, when a yellowish residue is left that is changed on further cautious heating to a deep rose-color, which disappears on cooling and re-appears on heating.

In advanced diabetes, dropsies in the limbs and under the chest and belly, puffy, swollen eyelids, cataracts, catarrhal inflammation of the lungs, weak, uncertain gait, and drowsiness may be noted.

Treatment is most satisfactory in cases dependent on some curable disease of liver, pancreas, lungs, or brain. Thus, in liver disease, a run at pasture in warm weather, or in winter a warm, sunny, well-aired stable, with sufficient clothing and laxatives (sulphate of soda, 1 ounce daily) and alkalies (carbonate of potassium, one-fourth ounce) may benefit. To this may be added mild blistering, cupping, or even leeching over the last ribs. Diseases of the brain or pancreas may be treated according to their indications. The diet should be mainly albuminous, such as wheat-bran or middlings, pease, beans, vetches, and milk. Indeed, an exclusive milk diet is one of the very best remedial agencies. It may be given as skim milk or butter-milk, and in the last case combines an anti-diabetic remedy in the lactic acid. Under such an exclusive diet recent and mild cases are often entirely restored, though at the expense of an attack of rheumatism. Codeia, one of the alkaloids of opium, is strongly recommended by Dr. Tyson. The dose for the horse would be 3 grains thrice daily. In cases in which there is manifest irritation of the brain bromide of potassium, 4 drams, or ergot, one-half ounce, may be resorted to. Salicylic acid and salicylate of sodium have proved useful in certain cases; also phosphate of sodium. Bitter tonics (especially nux vomica, one-half dram) are useful in improving the digestion and general health.

BLOODY URINE—HÆMATURIA.

As seen in the horse bloody urine is usually the direct result of mechanical injuries, as sprains and fractures of the loins, lacerations of the sub-lumbar muscles (psoas), irritation caused by stone in the kidney, ureter, bladder, or urethra. It may, however, occur with acute congestion of the kidney, with tumors in its substance, or with papilloma or other diseased growth in the bladder. Acrid diuretic plants present in the food may also lead to the escape of blood from the kidney. The predisposition to this affection is, however, incomparably less than in the case of the ox or sheep, the difference being attributed to the greater plasticity of the horse's blood in connection with the larger quantity of fibrine.

The blood may be present in small clots or in more or less intimate admixture with the urine. Its condition may furnish some indication as to its source; thus, if from the kidneys it is more likely to be uniformly diffused through the urine, while as furnished by the bladder or passages clots are more likely to be present. Again, in bleeding from the kidney, minute cylindrical clots inclosing blood globules and formed in the uriniferous tubes can be detected under the microscope. Precision also may be approximated by observing whether there is coexisting fracture, sprain of the loins, stone or tumor in the bladder or urethra.

The disease being mainly due to direct injury, *treatment* will consist first in removing such cause whenever possible, and then in applying general and local styptics. Irritants in food must be avoided, sprains appropriately treated, and stone in bladder or urethra removed. Then give mucilaginous drinks (slippery elm, linseed tea) freely, and styptics (tincture of chloride of iron, 3 drams; acetate of lead, one-half dram; tannic acid, one-half dram; or oil of turpentine, 1 ounce). If the discharge is abundant apply cold water to the loins and keep the animal perfectly still.

HÆMOGLOBINURIA—AZOTURIA—AZOTAEMIA—POISONING BY ALBUMINOIDS.

Like diabetes, this is rather a disease of the liver and blood-forming functions than of the kidney, but as prominent symptoms are loss of control over the hind limbs and the passage of ropy and dark-colored urine, the vulgar idea is that it is a disorder of the urinary organs. It is a complex affection directly connected with a plethora in the blood of nitrogenized constituents, with extreme nervous and muscular disorder and the excretion of a dense reddish or brownish urine. It is directly connected with high feeding, especially on highly nitrogenized food (oats, beans, pease, vetches, cotton-seed meal), and with a period of idleness in the stall under full rations. The disease is never seen at pasture, rarely under constant daily work, even though the feeding be high, and the attack is usually precipitated by taking the horse from the stable and subjecting it to exercise or work. The poisoning is not present when taken from the stable, as the horse is likely to be noticeably lively and spirited, but he will usually succumb under the first hundred yards or half mile of exercise. It seems as if the aspiratory power of the chest under the sudden exertion and accelerated breathing speedily drew from the gorged liver and abdominal veins (portal) the accumulated store of nitrogenous matter in an imperfectly oxidized or elaborated condition, and as if the blood, surcharged with these materials, was unable to maintain the healthy functions of the nerve centers and muscles. A peculiar anatomical feature of the horse's liver doubtless contributes to this, namely, the persistence, throughout life, of several considerable veins leading directly from the veins of the stomach and intestines (portal veins) into the posterior vena cava and heart.

This condition, common to fœtal mammals, persists through life in the solipeds only, among our domestic animals. In all others the portal vein has no communication with the vena cava except through the capillaries of the liver. With the direct channel the rich, crude blood coming from the intestines is drawn at once into the general circulation unchanged by the secretion in the liver and the chemical changes therein effected. Hence this disease is peculiar to solipeds. It has been noticed rather more frequently in mares than horses, attributable, perhaps, to the nervous excitement attendant on *heat* and to the fact that

the unmutilated mare is naturally more excitable than the docile gelding.

Symptoms.—In the milder forms this affection may appear as a lameness in one limb, from indefinite cause, succeeding to some sudden exertion and attended by a dusky-brown color of the membranes of the eye and nose and some wincing when the last ribs are struck. The severe forms come on after one or two days of rest on a full ration, when the animal has been taken out and driven one hundred paces or more. The fire and life with which he had left the stable suddenly give place to dullness and oppression, as shown in heaving flanks, dilated nostrils, pinched face, perspiring skin, and trembling body. The muscles of the loins or haunch become swelled and rigid, the subject moves stiffly or unsteadily, crouches behind, the limbs being carried semi-flexed, and he soon drops, unable to support himself. When down, the body and limbs are moved convulsively, but there is no power of co-ordination of movement in the muscles. The pulse and breathing are accelerated, the eyes red with a tinge of brown, and the urine, if passed, is seen to be highly colored, dark brown, red, or black, but it contains neither blood clots nor globules. The color is mainly due to hæmoglobin and other imperfectly elaborated constituents of the blood.

It may end fatally in a few hours or days, or a recovery may ensue, which is usually more speedy and perfect if it has set in at an early stage. In the late and tardy recoveries a partial paralysis of the hind limbs may last for months. A frequent sequel of these tardy cases is an extensive wasting of the muscles leading up from the front of the stifle (those supplied by the crural nerve), and a complete inability to stand.

The *prevention* of this serious affection lies in restricting the diet and giving daily exercise when the animal is not at work. A horse that has had one attack should never be left idle for a single day in the stall or barn-yard. When a horse has been condemned to absolute repose on good feeding he may have a laxative (one-half to 1 pound Glauber salts), and have graduated exercise, beginning with a short walk and increasing day by day.

The *treatment* of the mild cases may consist in a laxative, graduated daily exercise, and a daily dose of saltpeter (1 ounce). Sudden attacks will sometimes promptly subside if taken on the instant and the subject kept still and calmed by a dose of bromide of potassium (4 drams) and sweet spirits of niter (1 ounce). The latter has the advantage of increasing the secretion of the kidneys. In severe cases, as a rule, it is desirable to begin treatment by a full dose of aloes (4 to 6 drams) with the above-named dose of bromide of potassium, and this latter may be continued at intervals of four or six hours, as may be requisite to calm the nervous excitement. Fomentations with warm water over the loins are always useful in calming the excitable condition of the spinal cord, muscles, liver, and kidneys, and also in favor-

ing secretion from the two latter. On the second day diuretics may be resorted to, such as saltpeter, one-half ounce, and powdered colchicum, one-half dram, to be repeated twice daily. A laxative may be repeated in three or four days should the bowels seem to demand it, and as the nervous excitement disappears any remaining muscular weakness or paralysis may be treated by one-half dram doses of nux vomica twice a day and a stimulating liniment (aqua ammonia and sweet-oil in equal proportions) rubbed on the torpid muscles.

During the course of the disease friction to the limbs is useful, and in the advanced paralytic stage the application of electricity along the line of the affected muscles. When the patient can not stand he must have a thick, soft bed, and should be turned from side to side at least every twelve hours. As soon as he can be made to stand he may be helped up and even supported in a sling.

ACUTE INFLAMMATION OF THE KIDNEYS—ACUTE NEPHRITIS.

Inflammations of the kidneys have been differentiated widely, according as they were acute or chronic, parenchymatous or tubal, suppurative or not, with increased or shrunken kidney, etc., but in a work like the present, utility will be consulted by classing all under *acute* or *chronic inflammation.*

The *causes* of inflammation of the kidneys are extremely varied. Congestion occurs from the altered and irritant products passed through these organs during recovery from inflammations of other organs and during fevers. This may last only during the existence of its cause, or may persist and become aggravated. Heart disease, throwing the blood pressure back on the veins and kidneys, is another cause. Disease of the ureter or bladder, preventing the escape of urine from the kidney and causing increased fullness and tension in its pelvis and tubes, will determine inflammation. Decomposition of the detained urine in such cases, and the production of ammonia and other irritants, must also be named. The advance of bacteria upward from the bladder to the kidney is another cause. The consumption in hay or other fodder of acrid or irritant plants, including fungi, the absorption of cantharidine from a surface blistered by Spanish flies, the reckless administration of diuretics, the presence of stones in the kidney, exposure of the surface to cold and wet, and the infliction of blows or sprains on the loins, may contribute to its production. Liver disorders which throw on the kidneys the work of excreting irritant products, diseases of the lungs and heart from which clots are carried, to be arrested in the small blood-vessels of the kidney, and injuries and paralysis of the spinal cord, are additional causes.

The *symptoms* are more or less fever, manifest stiffness of the back and straddling gait with the hind limbs, difficulty in lying down and rising, or in walking in a circle, the animal sometimes groaning under the effort, arching of the loins and tucking up of the flank, looking back at the

abdomen as if from colicky pain, and tenderness of the loins to pinching, especially just beneath the bony processes 6 inches to one side of the median line. Urine is passed frequently, a small quantity at a time, of a high color, and sometimes mixed with blood or even pus. Under the microscope it shows the microscopic casts referred to under general symptoms. If treated by acetic acid, boiling, and subsequent addition of strong nitric acid, the resulting and persistent precipitate indicates the amount of albumen. The legs tend to swell from the foot up, also the dependent parts beneath the belly, and chest, and effusions of liquid may occur within the chest or abdomen. In the male animal the alternate drawing up and relaxation of the testicles in the scrotum are suggestive, and in small horses the oiled hand introduced into the rectum may reach the kidney and ascertain its sensitiveness.

Treatment demands, first, the removal of any recognized cause. Then, if the suffering and fever are high, 2 to 4 quarts of blood may be abstracted from the jugular vein; in weak subjects or unless in high fever this should be omitted. Next relieve the kidneys as far as possible by throwing their work on the bowels and skin. A pint of castor oil is less likely than either aloes or salts to act on the kidneys. To affect the skin a warm stall and heavy clothing may be supplemented by dram doses of Dover's powder. Boiled flaxseed may be added to the drinking water, and also thrown into the rectum as an injection, and blankets saturated with hot water should be persistently applied to the loins. This may be followed by a very thin pulp of the best ground mustard made with tepid water, rubbed in against the direction of the hair, and covered up with paper and a blanket. This may be kept on for an hour, or until the skin thickens and the hair stands erect. It may then be rubbed or sponged off and the blanket re-applied. When the action of the bowels has been started it may be kept up by a daily dose of 2 or 3 ounces of Glauber salts.

During recovery a course of bitter tonics (nux vomica 1 scruple, ground gentian root 4 drams), should be given. The patient should also be guarded against cold, wet, and any active exertion for some time after all active symptoms have subsided.

CHRONIC INFLAMMATION OF THE KIDNEYS.

Chronic inflammation of the kidneys is more commonly associated with albumen and casts in the urine than the acute form, and in some instances these conditions of the urine may be the only prominent symptoms of the disease. Though it may supervene on blows, injuries, and exposures, it is much more commonly connected with faulty conditions of the system—as indigestion, heart disease, lung or liver disease, imperfect blood formation or assimilation. In short, it is rather the attendant on a constitutional infirmity than on a simple local injury.

It may be associated with various forms of diseased kidney, as shrinkage (atrophy), increase (hypertrophy), softening, red congestion, white

enlargement, etc., so that it forms a group of diseases rather than a disease by itself.

The *symptoms* may include stiffness, weakness, and increased sensibility of the loins, and modified secretion of urine (increase or suppression), or the flow may be natural. Usually it contains albumen, the amount furnishing a fair criterion of the gravity of the affection, and microscopic casts, also most abundant in bad cases. Dropsy, manifested in swelled legs, is a significant symptom, and if the effusion takes place along the lower line of the body, or in chest or abdomen, the significance is increased. A scurfy, unthrifty skin, lack-luster hair, inability to sustain severe or continued exertion, poor or irregular appetite, loss of fat and flesh, softness of the muscles, and pallor of the eyes and nose are equally suggestive. So are skin eruptions of various kinds. Any one or more of these symptoms would warrant an examination of the urine for albumen and casts, the finding of which signifies renal inflammation.

Treatment of these cases is not always satisfactory, as the cause is liable to be maintained in the disorders of important organs elsewhere. If any such coincident disease of another organ or function can be detected, that should be treated first or simultaneously with this affection of the kidneys. In all cases the building up of the general health is important. Hence a course of tonics may be given (phosphate of iron, 2 drams; nux vomica, 20 grains; powdered gentian root, 4 drams, daily), or 60 drops of sulphuric acid or nitro-muriatic acid may be given daily in the drinking water. If there is any elevated temperature of the body and tenderness of the loins, fomentations may be applied, followed by a mustard pulp as for acute inflammation, and even in the absence of these indications the mustard may be resorted to with advantage at intervals of a few days. In suppression of urine, fomentations with warm water or with infusion of digitalis leaves is a safer resort than diuretics, and cupping over the loins may also benefit. To apply a cup shave the skin and oil it; then take a narrow-mouthed glass, rarify the air within it by introducing a taper in full flame for a second, withdraw the taper and instantly apply the mouth of the glass to the skin and hold it closely applied till the cooling tends to form a vacuum in the glass and to draw up the skin, like a sucker.

As in the acute inflammation, every attention must be given to secure warm clothing, a warm stall, and pure air.

TUMORS OF THE KIDNEYS—PARASITES.

Tumors, whether malignant or simple, would give rise to symptoms resembling some form of inflammation, and are not likely to be recognized during life. To parasites of the kidney belong the *echinococcus*, the larval or bladder-worm stage of the small echinococcus tape-worm of the dog; also the *Cysticercus fistularis*, another bladder-worm of an unknown tape-worm; but in these there is the possibility of the pas-

sage with the urine of a detached head of the bladder-worm or of some of its microscopic hooklets, which might be found in the sediment of the urine. So with *Strongylus gigas* (giant strongle), the largest of round worms, which has been found in the kidney of the horse, and the presence of which could only be certified by the passage of its microscopic eggs or of the entire worm.

SPASM OF THE NECK OF THE BLADDER.

This affection consists in spasmodic closure of the outlet from the bladder by tonic contraction of the circular muscular fibers. It may be accompanied by a painful contraction of the muscles on the body of the bladder, or if the organ is already unduly distended these will be affected with temporary paralysis. It is most frequent in the horse, but by no means unknown in the mare.

The *causes* are usually hard and continuous driving without opportunity for passing urine, cold rain-storms, draughts of cold air when perspiring and fatigued, the administration of Spanish fly or the application of extensive blisters of the same, abuse of diuretics, the presence of acrid diuretic plants in the fodder, and the presence of stone in the bladder. As most mares refuse to urinate while in harness, they should be unhitched at suitable times for urination. Spasms of the bowels are always attended by spasm of the bladder, hence the free passage of water is usually a symptom of relief.

The *symptoms* are frequent stretching and straining to urinate, with no result or a slight dribbling only. These vain efforts are attended by pain and groaning. On resuming his natural position the animal is not freed from the pain, but moves uneasily, paws, shakes the tail, kicks at the abdomen with his hind feet, looks back to the flank, lies down and rises, arches the back, and attempts to urinate as before. If the oiled hand is introduced into the rectum the greatly distended bladder may be felt beneath, and the patient will often shrink when it is handled.

It is important to notice that irritation of the urinary organs is often present in impaction of the colon with solid matters, because the impacted intestine under the straining of the patient is forced backward into the pelvis and presses upon and irritates the bladder. In such cases the horse stands with his fore limbs advanced and the hind ones stretched back beyond the natural posture, and makes frequent efforts to urinate with varying success. Unpracticed observers naturally conclude that the secondary urinary trouble is the main and only one, and the intestinal impaction and obstruction is too often neglected until it is irremediable. In cases where the irritation has caused spasm of the neck of the bladder and overdistension of that organ, the mistake is still more easily made, hence it is important in all cases to examine for the impacted bowel, forming a bend or loop at the entrance of the pelvis and usually toward the left side. The impacted intestine feels soft and

doughy, and is easily indented with the knuckles, forming a marked contrast with the tense, elastic, resilient overdistended bladder.

It remains to be noted that similar symptoms may be determined by a stone, or sebaceous mass, or stricture obstructing the urethra, or in the new-born by thickened mucus in that duct and the pressure of hardened impacted feces in the rectum. . In obstruction, the hard impacted body can usually be felt by tracing the urethra along the lower and posterior surface of the penis and forward to the median line of the floor of the pelvis to the neck of the bladder. That part of the urethra between the seat of obstruction and the bladder is usually distended with urine, and feels enlarged, elastic, and fluctuating.

Treatment may be begun by taking the animal out of harness. This failing, spread clean litter beneath the belly or turn the patient out on the dung-heap. Some seek to establish sympathetic action by pouring water from one vessel into another with dribbling noise. Others soothe and distract the attention by slow whistling. Friction of the abdomen with wisps of straw may succeed, or it may be rubbed with ammonia and oil. These failing, an injection of 2 ounces of laudanum or of an infusion of 1 ounce of tobacco in water may be tried. In the mare the neck of the bladder is easily dilated by inserting two oiled fingers and slightly parting them. In the horse the oiled hand introduced into the rectum may press from before backward on the anterior or blind end of the bladder. Finally a well-oiled gum-elastic catheter may be entered into the urethra through the papilla at the end of the penis and pushed on carefully until it has entered the bladder. To effect this the penis must first be withdrawn from its sheath, and when the advancing end of the catheter has reached the bend of the urethra beneath the anus it must be guided forward by pressure with the hand, which guidance must be continued onward into the bladder, the oiled hand being introduced into the rectum for this purpose. The horse catheter, 3½ feet long and one-third inch in diameter, may be bought of a surgical-instrument maker.

PARALYSIS OF THE BLADDER.

Paralysis of the body of the bladder with spasm of the neck has been described under the last heading, and may occur in the same way from overdistension in tetanus, acute rheumatism, paraplegia, and hemiplegia, in which the animal can not stretch himself to stale, and in cystitis, affecting the body of the bladder but not the neck. In all these cases the urine is suppressed. It also occurs as a result of disease of the posterior end of the spinal marrow and with broken back, and is then associated with palsy of the tail, and it may be of the hind limbs.

The *symptoms* are a constant dribbling of urine when the neck is involved, the liquid running down the inside of the thighs and irritating the skin. When the neck is unaffected the urine is retained until the bladder is greatly overdistended, when it may be expelled in a gush

by the active contraction of the muscular walls of the abdomen; but this never empties the bladder, and the oiled hand introduced through the rectum may feel the soft, flabby organ still half full of urine. This retained urine is liable to decompose and give off ammonia, which dissolves the epithelial cells, exposing the raw mucous membrane, and causing the worst type of cystitis. Suppression and incontinence of urine are common also to obstruction of the urethra by stone or otherwise; hence this source of fallacy should be excluded by manual examination along the whole course of that duct.

Treatment is only applicable in cases in which the determining cause can be abated. In remediable sprains of the back or disease of the spinal cord these must have appropriate treatment, and the urine must be drawn off frequently with a catheter to prevent overdistension and injury to the bladder. If the paralysis persists after recovery of the spinal cord, or if it continues after relief of spasm of the neck of the bladder, apply a pulp of mustard and water over the back part of the belly in front of the udder, and cover with a rug until the hair stands erect. In the male the mustard may be applied between the thighs from near the anus downward. Daily doses of 2 drams extract of belladonna, or of 2 grains powdered Spanish fly, may serve to rouse the lost tone. These failing, a mild current of electricity daily may succeed.

INFLAMMATION OF THE BLADDER—CYSTITIS—UROCYSTITIS.

Cystitis may be slight or severe, acute or chronic, partial or general. It may be caused by abuse of diuretics, especially such as are irritating (cantharides, turpentine, copaiba, resin, etc.), by the presence of a stone or gravel in the bladder, the irritation of a catheter or other foreign body introduced from without, the septic ferment (bacterium) introduced on a filthy catheter, the overdistension of the bladder by retained urine, the extrication of ammonia from retained decomposing urine, resulting in destruction of the epithelial cells and irritation of the raw surface, and a too-concentrated and irritating urine. The application of Spanish flies or turpentine over a too-extensive surface, sudden exposure of a perspiring and tired horse to cold or wet, and the presence of acrid plants in the fodder may cause cystitis, as they may nephritis. Finally, inflammation may extend from a diseased vagina or urethra to the bladder.

The *symptoms* are slight or severe colicky pains; the animal moves his hind feet uneasily or even kicks at the abdomen, looks around at his flank, and may even lie down and rise frequently. More characteristic are frequently repeated efforts to urinate, resulting in the discharge of a little clear, or red, or more commonly flocculent urine, always in jets, and accompanied by signs of pain, which persist after the discharge, as shown in continued straining, groaning, and perhaps in movements of the feet and tail. The penis hangs from the sheath,

or in the mare the vulva is frequently opened and closed, as after urination. The animal winces when the abdomen is pressed in the region of the sheath or udder, and the bladder is found to be sensitive and tender when pressed with the oiled hand introduced through the rectum or vagina. In the mare the thickening of the walls of the bladder may be felt by introducing one finger through the urethra. The discharged urine, which may be turbid or even oily, contains an excess of mucus, with flat shreds of membrane, with scaly epithelial cells, and pus corpuscles, each showing two or more nuclei when treated with acetic acid, but there are no microscopic tubular casts, as in nephritis. If due to stone in the bladder, that will be found on examination through rectum or vagina.

Treatment implies, first, the removal of the cause, whether poisons in food or as medicine, the removal of Spanish flies or other blistering agents from the skin, or the extraction of stone or gravel. If the urine has been retained and decomposed it must be completely evacuated through a clean catheter, and the bladder thoroughly washed out with a solution of 1 dram of borax in a quart of water. This must be repeated twice daily until the urine no longer decomposes, because as long as ammonia is developed in the bladder the protecting layer of epithelial cells will be dissolved and the surface kept raw and irritable. The diet must be light (bran mashes, roots, fresh grass), and the drink impregnated with linseed tea, or solution of slippery-elm or marsh-mallow. The same agents may be used to inject into the rectum, or they may even be used along with borax and opium to inject into bladder (gum arabic, 1 dram; opium, 1 dram; tepid water, 1 pint). Fomentations over the loins are often of great advantage, and these may be followed or alternated with the application of mustard, as in paralysis. Or the mustard may be applied on the back part of the abdomen below, or between the thighs from the anus downward. Finally, when the acute symptoms have subsided, a daily dose of buchu 1 dram, and nux vomica one-half dram, will serve to restore lost tone.

IRRITABLE BLADDER.

Some horses, and especially mares, show an irritability of the bladder and nerve centers presiding over it by frequent urination in small quantities, though the urine is not manifestly changed in character and no more than the natural amount is passed in the twenty-four hours. The disorder appears to have its source quite as frequently in the generative or nervous system as in the urinary. A troublesome and dangerous form is seen in mares, which dash off and refuse all control by the rein if driven with a full bladder, but usually prove docile if the bladder has been emptied before hitching. In other cases the excitement connected with getting the tail over the reins is a powerful determining cause. The condition is marked in many mares during the period of *heat*.

An oleaginous laxative (castor oil 1 pint) will serve to remove any cause of irritation in the digestive organs, and a careful dieting will avoid continued irritation by acrid vegetable agents. The bladder should be examined to see that there is no *stone* or other cause of irritation, and the sheath and penis should be washed with soap-suds, any sebaceous matter removed from the bilocular cavity at the end of the penis, and the whole lubricated with sweet oil. Irritable mares should be induced to urinate before they are harnessed, and those that clutch the lines under the tail may have the tail set high by cutting the cords on its lower surface, or it may be prevented getting over the reins by having a strap carried from its free end to the breeching. Those proving troublesome when in heat may have 4-dram doses of bromide of potassium, or they may be served by the male or castrated. Sometimes irritability may be lessened by daily doses of belladonna extract (1 dram), or a better tone may be given to the parts by balsam copaiba (1 dram).

DISEASED GROWTHS IN THE BLADDER.

These may be of various kinds, malignant or simple. In the horse I have found villous growths from the mucous membrane especially troublesome. They may be attached to the mucous membrane by a narrow neck or by a broad base covering a great part of the organ. The *symptoms* are frequent straining, passing of urine and blood with occasionally gravel. An examination of the bladder with the hand in the rectum will detect the new growth, which may be distinguished from a hard resistant *stone*. In mares, in which the finger can be inserted into the bladder, the recognition is still more satisfactory. The polypi attached by narrow necks may be removed by surgical operation, but for those with broad attachments treatment is eminently unsatisfactory.

DISCHARGE OF URINE BY THE NAVEL—PERSISTENT URACHUS.

This occurs only in the new-born, and consists in the non-closure of the natural channel (urachus), through which the urine is discharged into the outer water-bag (allantois) in fœtal life. At that early stage of the animal existence the bladder resembles a long tube, which is prolonged through the navel string and opens into the outermost of the two water-bags in which the fœtus floats. In this way the urine is prevented from entering the inner water-bag (amnios), where it would mingle with the liquids, bathing the skin of the fœtus and cause irritation. At birth this channel closes up, and the urine takes the course normal to extra-uterine life. Imperfect closure is more frequent in males than in females, because of the great length and small caliber of the male urethra and its consequent tendency to obstruction. In the female there may be a discharge of a few drops only at a time, while in the male the urine will be expelled in strong jets coincidently with the contractions of the bladder and walls of the abdomen.

The first care is to ascertain if the urethra is pervious by passing a human catheter. This determined, the open urachus may be firmly closed by a stout waxed thread, carried with a needle through the tissues back of the opening and tied in front of it so as to inclose as little skin as possible. If a portion of the navel string remains, the tying of that may be all sufficient. It is important to tie as early as possible so as to avoid inflammation of the navel from contact with the urine. In summer a little carbolic acid water or tar water may be applied to keep off the flies.

EVERSION OF THE BLADDER.

This can occur only in the female. It consists in the turning of the organ outside in through the channel of the urethra, so that it appears as a red, pear-shaped mass hanging from the floor of the vulva and protruding externally between its lips. It may be a mass like the fist, or it may swell up to the size of an infant's head. On examining its upper surface the orifices of the urethra may be seen, one on each side, a short distance behind the neck, with the urine oozing from them drop by drop.

This displacement usually supervenes on a flaccid condition of the bladder, the result of paralysis, over distention, or severe compression during a difficult parturition.

The protruding organ may be washed with a solution of 1 ounce of laudanum and a teaspoonful of carbolic acid in a quart of water, and returned by pressing a smooth, rounded object into the fundus and directing it into the urethra, while careful pressure is made on the surrounding parts with the other hand. If too large and resistant it may be wound tightly in a strip of bandage about two inches broad so as to express the great mass of blood, and exudate and diminish the bulk of the protruded organ so that it can be easily pushed back. This method has the additional advantage of protecting the organ against bruises and lacerations in the effort made to return it. After the return straining may be kept in check by giving laudanum (1 to 2 ounces), and by applying a truss to press upon the lips of the vulva (see eversion of the womb.) The patient should be kept in a stall a few inches lower in front than behind, so that the action of gravity will favor retention.

INFLAMMATION OF THE URETHRA—URETHRITIS—GLEET.

This affection belongs quite as much to the generative organs, yet it can not be entirely overlooked in a treatise on urinary disorders. It may be induced by the same causes as cystitis (which see), by the passage and temporary arrest of small *stones*, or gravel, by the irritation caused by foreign bodies introduced from without, by blows on the penis by sticks, stones, or by the feet of a mare which kicks while being served, by an infecting inflammation contracted from a mare served in

the first few days after parturition, or one suffering from leucorrhœa, by infecting matter introduced on a dirty catheter, or by the extension of inflammation from an irritated bilocular cavity filled with hardened sebaceous matter, or from an uncleansed sheath.

The *symptoms* are swelling, heat, and tenderness of the sheath and penis, difficulty, pain, and groaning in passing urine, which is liable to sudden temporary arrests in the course of a micturition, and later a whitish muco-purulent oozing from the papilla on the end of the penis. There is a tendency to erection of the penis, and in cases contracted from a mare the outer surface of that organ will show more or less extensive sores and ulcers. Stallions suffering in this way will refuse to mount, or having mounted will fail to complete the act of coition. If an entrance is effected infection of the mare is liable to follow.

Treatment in the early stages consists in a dose of physic (aloes, 6 drams), and fomentations of warm water to the sheath and penis. If there is reason to suspect the presence of infection, inject the urethra twice daily with borax 1 dram, water 1 quart, using it tepid. Where the muco-purulent discharge indicates the supervention of the second stage, a more astringent injection may be employed (nitrate of silver 20 grains, water 1 quart), and the same may be applied to the surface of the penis and inside the sheath. Balsam of copaiba (1 dram daily) may also be given with advantage after the purulent discharge has appeared.

Every stallion suffering from urethritis should be withheld from service, as should mares with leucorrhœa.

STRICTURE OF THE URETHRA.

This is a permanent narrowing of the urethra at a given point, the result of previous inflammation, caused by the passage or arrest of a stone or gravel, by strong astringent injections in the early non-secreting stages of urethritis, or by contraction of the lining membrane occurring during the healing of ulcers in neglected inflammations of that canal. The trouble is shown by the passage of urine in a fine stream with straining, pain, and groaning, and by frequent painful erections. It must be remedied by mechanical dilatation, with catheters just large enough to pass with gentle force, to be inserted once a day, and to be used of larger size as the passage will admit them. The catheter should be kept perfectly clean, and washed in a borax solution and well oiled before it is introduced.

URINARY CALCULI—STONE—GRAVEL.

These consist in some of the solids of the urine that have been precipitated from the urine in the form of crystals, which remain apart as a fine powdery mass or magma, or aggregate into calculi or stones of varying size. Their composition is therefore determined in different animals by the salts and other constituents found dissolved in the

healthy urine, and by the additional constituents which may be thrown off in solution in the urine in disease. In this connection it is important to observe the following analysis of the horse's urine in health:

Water	918.5
Urea	13.4
Uric acid and urates	0.1
Hippuric acid	26.4
Lactic acid and lactates	1.0
Mucus and organic matter	22.0
Sulphates (alkaline)	1.2
Phosphates (lime and soda)	0.2
Chlorides (sodium)	1.0
Carbonates (potash, magnesia, lime)	16.0
	1000.0

The carbonate of lime, which is present in large amount in the urine of horses fed on green fodder, is practically insoluble, and therefore forms in the passages after secretion, and its microscopic rounded crystals give the urine of such horses a milky whiteness. It is this material which constitutes the soft, white, pultaceous mass that sometimes fills the bladder to repletion and requires to be washed out. In hay-fed horses carbonates are still abundant, while in those mainly grain-fed they are replaced by hippurates and phosphates—the products of the wear of tissues—the carbonates being the result of oxidation of the vegetable acids in the food. Carbonate of lime, therefore, is a very common constituent of urinary calculi in herbivora, and in many cases is the most abundant constituent.

Oxalate of lime, like carbonate of lime, is derived from the burning up of the carbonaceous matter of the food in the system, one important factor being the less perfect oxidation of the carbon. Indeed, Fürstenberg and Schmidt have demonstrated on man, horse, ox, and rabbit, that under the full play of the breathing (oxidizing) forces oxalic, like other organic acids, is resolved into carbonic acid. In keeping with this is the observation of Lehmann that in all cases in which man suffered from interference with the breathing, oxalate of lime appeared in the urine. An excess of oxalate of lime in the urine may, however, claim a different origin. Uric and hippuric acids are found in the urine of carnivora and herbivora, respectively, as the result of the healthy wear (disassimilation) of nitrogenous tissues. But if these products are fully oxidized they are thrown out in the form of the more soluble urea rather than as these acids. When uric acid out of the body is treated with peroxide of lead it is resolved into urea, allantoine, and oxalic acid, and Wœhler and Frerichs found that the administration of uric acid not only increased the excretion of urea, but also of oxalic acid. It may therefore be inferred that oxalic acid is not produced from the carbonaceous food alone, but also from the disintegration of the nitrogenous tissues of the body. An important element of its production is, however, the imperfect performance of the breathing functions, and

hence it is liable to result from diseases of the chest (heaves, chronic bronchitis, etc.). This is above all likely to prove the case if the subject is fed to excess on highly carbonaceous foods (grass and green food generally, potatoes, etc.).

Carbonate of magnesia, another almost constant ingredient of the urinary calculi of the horse, is formed in the same way as the carbonate of lime, from the excess of carbonaceous food (organic acids), becoming oxidized into carbon dioxide, which unites with the magnesia derived from the food.

The phosphates of lime and magnesia are not abundant in urinary calculi of the horse, the phosphates being only present to excess in the urine in two conditions; (*a*) when the ration is excessive and specially rich in phosphorus (wheat bran, beans, peas, vetches, rape cake, oil cake, cotton-seed cake); and (*b*) when through the morbid destructive changes in the living tissues, and especially of the bones, a great amount of phosphorus is given off as a waste product. Under these conditions, however, the phosphates may contribute to the formation of calculi, and this is, above all, likely if the urine is retained in the bladder until it has undergone decomposition and given off ammonia. The ammonia at once unites with the phosphate of magnesia to form a double salt, phosphate of ammonia and magnesia, which, being insoluble, is at once precipitated. The precipitation of this salt is, however, rare in the urine of the horse, though much more frequent in that of man and sheep.

These are the chief mineral constituents of the urine which form ingredients in the horse's calculi, for though iron and manganese are usually present it is only in minute quantities.

The excess of mineral matters in a specimen of urine unquestionably contributes to the formation of calculi, just as solution of such matters out of the body is increasingly disposed to throw them down in the form of crystals as it becomes more concentrated and approaches nearer to the condition of saturation. Hence, in considering the causes of calculi we can not ignore the factor of an excessive ration, rich in mineral matters and in carbonaceous matters (the source of carbonates and much of the oxalates), nor can we overlook the concentration of the urine that comes from dry food and privation of water, or from the existence of fever which causes suspension of the secretion of water. In these cases, at least the usual amount of solids are thrown off by the kidneys, and as the water is diminished there is danger of its approaching the point of supersaturation, when the dissolved solids must necessarily be thrown down. Hence, calculi are more common in stabled horses fed on dry grain and hay, in those denied a sufficiency of water or that have water supplied irregularly, in those subjected to profuse perspiration (as in summer), and in those suffering from a watery diarrhea. On the whole, calculi are most commonly found in winter, because the horses are then on dry feeding, but such dry feeding is

even more conducive to them in summer when the condition is aggravated by the abundant loss of water by the skin.

In the same way the extreme hardness of the water in certain districts must be looked upon as contributing to the concentration of the urine and correspondingly to the production of stone. The carbonates, sulphates, etc., of lime and magnesia taken in the water must be again thrown out, and just in proportion as these add to the solids of the urine they dispose it to precipitate its least soluble constituents. Thus the horse is very obnoxious to calculi on certain limestone soils, as over the calcareous formations of central and western New York, Pennsylvania, and Ohio, in America; of Norfolk, Suffolk, Derbyshire, Shropshire, and Gloucestershire, in England; of Poitou and Landes, in France; and Munich, in Bavaria.

But the saturation of the urine from any or all of these conditions can only be looked on as an auxiliary cause, and not as in itself an efficient one, except on the rarest occasions. For a more direct and immediate cause we must look to the organic matter which forms a large proportion of all urinary calculi. This consists of mucus, albumen, pus, hyaline casts of the uriniferous tubes, epithelial cells, blood, etc., mainly agents that belong to the class of colloid or non-crystalline bodies. A horse may live for months and years with the urine habitually of a high density, and having the mineral constituents in excess, without the formation of stone or gravel; and again one with dilute urine of low specific gravity will have a calculus.

Rainey, Ord, and others furnish the explanation. They not only show that a colloid body, like mucus, albumen, pus, or blood, determined the precipitation of the crystalline salts in the solution, but they determined the precipitation in the form of globules or spheres, capable of developing by further deposits into calculi. Heat intensifies this action of the colloids, and a colloid in a state of decomposition is specially active. The presence, therefore, of developing fungi and bacteria must be looked upon as active factors in causing calculi.

In looking, therefore, for the immediate causes of calculi we must consider especially all those conditions which determine the presence of albumen, blood, and excess of mucus, pus, etc., in the urine. Thus diseases of distant organs leading to albuminuria, diseases of the kidneys and urinary passages causing the escape of blood or the formation of mucus or pus, become direct causes of calculi. Foreign bodies of all kinds in the bladder or kidney have long been known as determining causes of calculi, and as forming the central nucleus. This is now explained by the fact that these bodies are liable to carry bacteria into the passages and thus determine decomposition, and they are further liable to irritate the mucous membrane and become enveloped in a coating of mucus, pus, and perhaps blood.

The fact that horses appear to suffer from calculi, especially on the magnesian limestones, the same districts in which they suffer from

goiter, may be similarly explained. The unknown poison which produces goiter presumably leads to such changes in the blood and urine as will furnish the colloid necessary for precipitation of the urinary salts in the form of calculi.

Classification of Urinary Calculi.—These have been named according to the place where they are found, *renal* (kidney), *uretral* (ureter), *vesical* (bladder), *urethral* (urethra), and *preputial* (sheath or prepuce). They have been otherwise named according to their most abundant chemical constituent, *carbonate of lime*, *oxalate of lime*, and *phosphate of lime calculi.* The stones formed of carbonates or phosphates are usually smooth on the surface, though they may be molded into the shape of the cavity in which they have been formed; thus those in the pelvis of the kidney may have two or three short branch-like prolongations, while those in the bladder are round, oval, or slightly flattened upon each other. Calculi containing oxalate of lime on the other hand have a rough-open, crystalline surface, which has gained for them the name of mul, berry calculi, from a supposed resemblance to that fruit. These are usually covered with more or less mucus or blood, produced by the irritation of the mucous membrane by their rough surfaces. The color of calculi varies from white to yellow and deep brown, the shades depending mainly on the amount of the coloring matter of blood, bile, or urine which they may contain.

Renal Calculi.—These may consist of minute, almost microscopic deposits in the uriniferous tubes in the substance of the kidney, but more commonly they are large masses and lodged in the pelvis. The larger calculi, sometimes weighing 12 to 24 ounces, are molded in the pelvis of the kidney into a cylindroid mass, with irregular rounded swellings at intervals. Some have a deep brown, rough, crystalline surface of oxalate of lime, while others have a smooth, pearly white aspect from carbonate of lime. A smaller culculus, which has been called coralline, is also cylindroid, with a number of brown, rough, crystalline oxalate of lime branches and whitish depressions of carbonate. These vary in size from 15 grains to nearly 2 ounces. Less frequently are found masses of very hard, brownish white, rounded, pea-like calculi. These are smoother, but on the surface crystals of oxalate of lime may be detected with a lens. Some renal calculi are formed of more distinct layers, more loosely adherent to each other, and contain an excess of mucus but no oxalate of lime. Finally a loose aggregation of small masses, forming a very friable calculus, is found of all sizes within the limits of the pelvis of the kidney. These, too, are in the main carbonate of lime (84 to 88 per cent.), and without oxalate.

Symptoms of renal calculi are violent colicky pains appearing suddenly, very often in connection with exhausting work or the drawing of specially heavy loads, and in certain cases disappearing with equal suddenness. The nature of the colic becomes more manifest if it is associated with stiffness of the back and hind limbs, frequent passage

of urine, and above all the passage of gravel with the urine, especially at the time of the access of relief. The passage of blood and pus in the urine is equally significant. If the irritation of the kidney goes on to active inflammation then the symptoms of nephritis are added.

Uretral Calculi.—These are so-called because they are found in the passage leading from the kidney to the bladder. They are simply small renal calculi which have escaped from the pelvis of the kidney and have become arrested in the ureter. They give rise to *symptoms* almost identical with those of renal calculi, with this difference, that the colicky pains, caused by the obstruction of the ureter by the impacted calculus, are more violent, and if the calculus passes on into the bladder the relief is instantaneous and complete. If the ureter is completely blocked for a length of time the retained urine may give rise to destructive inflammation in the kidney, which may end in the entire absorption of that organ, leaving only a fibrous capsule containing an urinous fluid. If both the ureters are similarly blocked the animal will die of uræmic poisoning.

Treatment of Renal and Uretral Calculi.—This is unsatisfactory, as it is only the small calculi that can pass through the ureters and escape into the bladder. This may be favored by agents which will relax the walls of the ureters by counteracting their spasm and even lessening their tone, and by a liberal use of water and watery fluids to increase the urine and the pressure upon the calculus from behind. One or two ounces of laudanum or two drams of extract of belladonna, may be given and repeated as it may be necessary, the relief of the pain being a fair criterion of the abating of the spasm. To the same end use warm fomentations across the loins, and these should be kept up persistently until relief is obtained. These act not alone by soothing and relieving the spasm and inflammation, but they also favor the freer secretion of a more watery urine and thus tend to carry off the smaller calculi. To further secure this object give cool water freely, and let the food be only such as contains a large proportion of liquid, gruels, mashes, turnips, beets, apples, pumpkins, ensilage, succulent grasses, etc. If the acute stage has passed and the presence of the calculus is manifested only by the frequent passage of urine with gritty particles, by stiffness of the loins and hind limbs and by tenderness to pressure, the most promising resort is a long run at pasture where the grasses are fresh and succulent. The long-continued secretion of a watery urine will sometimes cause the breaking down of a calculus, as the imbibition of the less dense fluid by the organic sponge-like frame work of the calculus causes it to swell and thus lessens its cohesion. The same end is sought by the long continued use of alkalies (carbonate of potassium), and of acids (muriatic), each acting in a different way to alter the density and cohesion of the stone. But it is only exceptionally that any of these methods is entirely satisfactory. If inflammation of the kidneys develop, treat as advised under that head.

Stone in the bladder.—Vesical calculus.—Cystic calculus.—These may be of any size up to over a pound weight. One variety is rough and crystalline and has a yellowish white or deep brown color. These contain about 87 per cent. carbonate of lime, the remainder being carbonate of magnesia, oxalate of lime, and organic matter. The phosphatic calculi are smooth and white and formed of thin concentric layers of great hardness extending from the nucleus outward. Beside the phosphate of lime these contain the carbonates of lime and magnesia and organic matter. In some cases the bladder contains and may be even distended by a soft pultaceous mass made up of minute round granules of carbonates of lime and magnesia. This, when removed and dried, makes a firm, white, stony mass. Sometimes this magma is condensed into a solid mass in the bladder by reason of the binding action of the mucus and other organic matter, and then forms a conglomerate stone of nearly uniform consistency and without stratification.

The *symptoms* of stone in the bladder are more obvious than those of renal calculus. The rough mulberry calculi especially lead to irritation of the mucous membrane and frequent passing of urine in small quantities and often mingled with mucus or blood, or containing minute gritty particles. At times the flow is suddenly arrested, though the animal continues to strain and the bladder is not quite emptied. In the smooth phosphatic variety the irritation is much less marked, and may even be altogether absent. With the pultaceous deposit in the bladder there is incontinence of urine, which dribbles away continually and keeps the hair on the inner side of the thighs matted with soft magma. In all cases alike the calculus may be felt by the examination of the bladder with the oiled hand in the rectum. The pear-shaped outline of the bladder can be felt beneath, and within it the solid oval body. It is most easily recognized if the organ is half full of liquid, as then it is not grasped by the contracting walls of the bladder, but may be made to move from place to place in the liquid. If a pultaceous mass is present it has a soft, doughy feeling, and when pressed an indentation is left.

In the mare the hard stone may be touched by the finger introduced through the short urethra.

The *treatment* of stone in the bladder consists in the removal of the offending body. In the mare this is easily effected with the lithotomy forceps. These are slightly warmed and oiled, and carried forward along the floor of the passage of the vulva for 4 inches, when the orifice of the urethra will be felt exactly in the median line. Through this the forceps are gradually pushed with gentle oscillating movement until they enter the bladder and strike against the hard surface of the stone. The stone is now grasped between the blades, care being taken to include no loose fold of the mucous membrane, and it is gradually withdrawn with the same careful oscillating motions as before. Facility and safety in seizing the stone will be greatly favored by having the

bladder half full of liquid, and if necessary one oiled hand may be introduced into the rectum or vagina to assist. The resulting irritation may be treated by an injection of laudanum, 1 ounce, in a pint of tepid water.

The removal of the stone in the horse is a much more difficult proceeding. It consists in cutting into the urethra just beneath the anus and introducing the lithotomy forceps from this forward into the bladder, as in the mare. It is needful to distend the urethra with tepid water or to insert a sound or catheter to furnish a guide upon which the incision may be made, and in case of a large stone it may be needful to enlarge the passage by cutting in a direction upward and outward with a probe-pointed knife, the back of which is slid along in the groove of a director until it enters the bladder.

The horse may be operated upon in the standing position, being simply pressed against a wall by a pole passed from before backward along the other side of the body. The tepid water is injected into the end of the penis until it is felt to fluctuate under the pressure of the finger, in the median line over the bone just beneath the anus. The incision is then made into the center of the fluctuating canal, and from above downward. When a sound or catheter is used as a guide it is inserted through the penis until it can be felt through the skin at the point where the incision is to be made beneath the anus. The skin is then rendered tense by the thumb and fingers of the left hand pressing on the two sides of the sound, while the right hand, armed with a scalpel, cuts downward on to the catheter. This vertical incision into the canal should escape wounding any important blood-vessel. It is in making the obliquely lateral incision in the subsequent dilatation of the urethra and neck of the bladder that such danger is to be apprehended.

If the stone is too large to be extracted through the urethra it may be broken down with the lithotrite and extracted piecemeal with the forceps. The lithotrite is an instrument composed of a straight stem bent for an inch or more to one side at its free end so as to form an obtuse angle, and having on the same side a sliding bar moving in a groove in the stem and operated by a screw so that the stone may be seized between the two blades at its free extremity and crushed again and again into pieces small enough to extract. Extra care is required to avoid injury to the urethra in the extraction of the angular fragments, and the gravel or powder that can not be removed in this way must be washed out as advised below.

When a pultaceous magma of carbonate of lime accumulates in the bladder it must be washed out by injecting water through a catheter by means of a force pump or a funnel, shaking it up with the hand introduced through the rectum and allowing the muddy liquid to flow out through the tube. This is to be repeated until the bladder is empty and the water comes away clear. A catheter with a double tube is sometimes used, the injection passing in through the one tube and

escaping through the other. But the advantage is more apparent than real, as the retention of the water until the magma has been shaken up and mixed with it hastens greatly its complete evacuation. To *prevent* the formation of a new deposit any fault in feeding (dry grain and hay with privation of water, excess of beans, peas, wheat bran, etc.) and disorders of stomach, liver, and lungs must be corrected. Give abundance of soft drinking water, encouraging the animal to drink by a handful of salt daily; let the food be laxative, consisting largely of roots, apples, pumpkins, ensilage, and give daily in the drinking water a dram of carbonate of potash or soda. Powdered gentian root (3 drams daily) will also serve to restore the tone of the stomach and system at large.

Urethral calculus.—Stone in the urethra.—This is less frequent than in cattle and sheep, owing to the larger size of the urethra in the horse and the absence of the S-shaped curve and vermiform appendix. The calculi arrested in the urethra are never formed there, but consist of cystic calculi which have been small enough to pass through the neck of the bladder, but too large to pass through the whole length of the urethra and escape. Such calculi therefore are primarily formed either in the bladder or kidney, and have the chemical composition of the other calculi found in those organs. They may be arrested at any point of the urethra, from the neck of the bladder back to the bend of the tube beneath the anus, and from that point down to the extremity of the penis. I have found them most frequently in the papilla on the extreme end of the penis, and immediately behind this.

The *symptoms* are violent straining to urinate, but without any discharge, or with the escape of water in drops only. Examination of the end of the penis will detect the swelling of the papilla or the urethra behind it, and the presence of a hard mass in the center. A probe inserted into the urethra will strike against the gritty calculus. If the stone has been arrested higher up its position may be detected as a small, hard, sensitive knot on the line of the urethra, in the median line of the lower surface of the penis, or on the floor of the pelvis in the median line from the neck of the bladder back to the bend of the urethra beneath the anus. In any case the urethra between the neck of the bladder and the point of obstruction is likely to be filled with fluid, and to feel like a distended tube fluctuating on pressure.

Treatment may be begun by an attempt to extract the calculi by manipulation of the papilla on the end of the penis. This failing, the calculus may be seized with a pair of fine-pointed forceps and withdrawn from the urethra; or, if necessary, a probe-pointed knife may be inserted and the urethra slightly dilated, or even laid open, and the stone removed. If the stone has been arrested higher up it must be extracted by a direct incision through the walls of the urethra and down upon the nodule. If in the free (protractile) portion of the penis, that organ is to be withdrawn from its sheath until the nodule is ex-

posed and can be incised. If behind the scrotum, the incision must be made in the median line between the thighs and directly over the nodule, the skin having been rendered tense by the fingers and thumb of the left hand. If the stone has been arrested in the intra-pelvic portion of the urethra, the incision must be made beneath the anus and the calculus extracted with forceps, as in stone in the bladder. The wound in the urethra may be stitched up and usually heals slowly but satisfactorily. Healing will be favored by washing two or three times daily with a solution of a teaspoonful of carbolic acid in a pint of water.

Preputial calculus.—Calculus in the sheath or bilocular cavity.—These are concretions in the sheath, though the term has been also applied to the nodule of sebaceous matter which accumulates in the blind pouches (bilocular cavity) by the sides of the papilla on the end of the penis. Within the sheath the concretion may be a soft, cheesy-like sebaceous matter, or a genuine calculus of carbonate, oxalate, phosphate and sulphate of lime, carbonate of magnesia and organic matter. These are easily removed with the fingers, after which the sheath should be washed out with castile soap and warm water, and smeared with sweet-oil.

PLATE IV.

a, Cortical (or vascular) portion, b, Medullary (or tubular) portion, c, Peripheral portion of the latter, d, Interior of the pelvis, d', d', Arms of the pelvis, e, Border of the crest, f, Infundibulum, g, Ureter

Geo. Marx after D'Arboval, p. 669.

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LONGITUDINAL SECTION THROUGH KIDNEY.

PLATE V.

C

A

B

1

2

Structure of the Kidney. Diagrammatic.

a, Medullary layer; b, Boundary zone; c, Cortical layer; 1, Excretory tube, 2, Opening on the summit of renal papilla, 3, First branch of bifurcation, 4, Second branch of bifurcation; 5, Third branch of bifurcation; 6, Straight collecting tube; 7, Junctional tubule, 8, Ascending portion of Henle's loop, 9, Descending portion of Henle's loop; 10, Loop of Henle, 11, Convoluted tubule, 12, Malpighian corpuscle, 13, Renal artery; 14, Branch supplying the glomerulus; 15, Afferent vessel of the glomerulus, 16, Branch going directly to the capillaries; 17, Straight arterioles coming directly from the renal artery; 18, Straight arteriole coming from the afferent vessel of the glomerulus, 19, Straight arteriole coming from the capillary plexus; 20, Vascular loop of the pyramids; 21, Efferent vessel of the glomerulus going to the capillary plexus; 22, Capillary plexus of the glomerular part of the cortical substance; 23, Capillary plexus of the pyramids of Ferrein; 24, Cortical plexus of the kidney; 25, Venae stellatae; 26, Vein coming from the capillaries of the cortex; 27, Inter lobular vein, 28, Vein receiving the venae rectae; 29, Venae rectae.

Note. The shaded part of the urinary ducts represent the part in which the epithelium is rodded and of a granular appearance.

Geo. Marx after D'Arbeval, p. 372

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MICROSCOPIC ANATOMY OF KIDNEY.

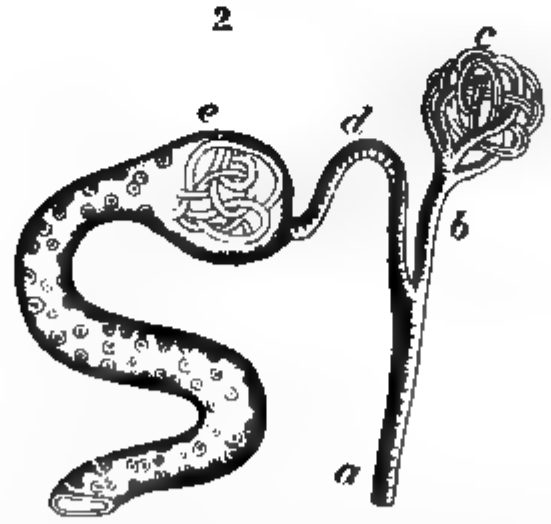
PLATE VI

1

Renal Glomerulus.

a, Artery of the glomerulus, b, Branch supplying the afferent vessel of the glomerulus, c, Afferent vessel of the glomerule, d, Artery going directly to the capillary plexus of the cortical substance, e, Capillary plexus, f, Glomerulus

2



Renal Glomerulus with its afferent vessels and efferents.

a, Branch of renal artery, b, Afferent vessel of the glomerulus, c, Glomerulus, d, Afferent vessel going into corpuscle e, of Malpighi

Geo. Marx after D'Arboval, p. 373

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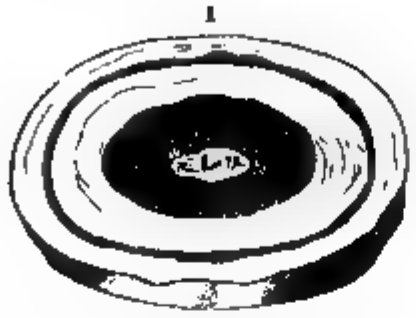
MICROSCOPIC ANATOMY OF KIDNEY.

PLATE VII.

1



Phosphatic calculus, uric acid nucleus.

2

X 215

Calculus of oxalate of lime

Renal casts. Some deprived of epithelium. Two are deeper colored from the presence of urate of soda

3

Straight forceps used in removing calculi.

Hamon, del after Hurtrel D'Arboval

Sackett & Wilhelms Litho Co NY

CALCULI AND INSTRUMENT FOR REMOVAL.

DISEASES OF THE RESPIRATORY ORGANS.

By W. H. HARBAUGH, V. S., Richmond, Virginia.

The organs pertaining to the respiratory function may be popularly classed as follows: The nasal openings, or nostrils; the nasal chambers, through which the air passes in the head; the sinuses in the head, communicating with the nasal chambers; the pharynx, common to the functions of respiration and alimentation; the larynx, a complicated structure situated at the top of the wind-pipe; the trachea, or wind-pipe; the bronchi (into which the wind-pipe divides), two tubes leading from the wind-pipe to the right and left lung, respectively; the bronchial tubes, which penetrate and convey air to all parts of the lungs; the lungs.

The pleura is a thin membrane that envelops the lung and is reflected against the walls of the thoracic cavity. The diaphragm is a muscular structure, completely separating the contents of the thoracic cavity from those of the abdominal cavity. It is essentially a muscle of inspiration, and the principal one. Other muscles aid in the mechanism of respiration, but the diseases or injuries of them have nothing to do with the class under consideration.

Just within the nasal openings the skin becomes gradually but perceptibly finer, until it is succeeded by the mucous membrane; the line of demarkation is not always well defined. Near about the junction of the skin and membrane is a small hole, presenting the appearance of having been made with a punch; this is the opening of the nasal duct, a canal that conveys the tears from the eyes. Within and above the nasal openings are the cavities or fissures called the false nostrils; if the finger is inserted up into them it will be demonstrated that the superior extremity is blind; just in this situation there is often found a little tumor, to be described hereafter. The nasal chambers are completely separated, the right from the left, by a cartilaginous partition. Each nasal chamber is divided into three continuous compartments by the two turbinated bones.

The mucous membrane lining the nasal chambers, and in fact the entire respiratory tract, is much more delicate and more frequently

diseased than the mucous membrane of any other part of the body. The sinuses of the head are compartments which communicate with the nasal chambers and are lined with a continuation of the same membrane that lines the nasal chambers; their presence increases the volume and modifies the form of the head without increasing its weight.

The horse, in a normal condition, breathes exclusively through the nostrils; no air passes through the mouth in respiration. This is one reason why horses probably are affected oftener with colds than other animals. The organs of respiration are more liable to disease than the organs connected with any other function of the animal, and, as many of the causes can be prevented, it is both important and profitable to know and study the causes. The respiratory surface in the lungs of the horse is estimated to be from 200 to 500 square feet.

The cause of many of the diseases of these organs may be given under a common head, because even a simple cold, if neglected or badly treated, may run into the most complicated lung disease and terminate fatally. In the spring and fall, when the animals are changing their coats, there is a marked predisposition to contract disease, and consequently care should be taken at those periods to prevent other exciting causes.

Badly ventilated stables are a frequent source of disease. It is a great mistake to think that country stables necessarily have purer air than city stables. Stables on some farms are so faultily constructed that it is almost impossible for the foul air to gain an exit. All stables should have an unlimited supply of pure air, and be so arranged that strong draughts can not blow directly on the animals. Hot stables are almost always illy ventilated, and the hot stable is a cause of disease on account of the extreme change of temperature a horse is liable to when taken out, and extreme changes of temperature are to be avoided as certain causes of disease. A horse taken from pasture and kept in a hot stable is almost sure to contract a cold; the stable should be thrown open and the temperature gradually increased in such cases, when practicable, to avoid the sudden change.

A cold, close stable is invariably damp, and is to be avoided as much as the hot, close, and foul stable. Horses changed from a cold to a warm stable are more liable to contract cold than when changed from a warm to a cold stable. Pure air is more essential than warmth, and this fact should be especially remembered when the stable is made close and foul to gain the warmth. It is more economical to keep the horse warm with blankets than to prevent the ingress of pure air in order to make the stable warm.

Stables should be well drained and kept clean. Some farmers allow dung to accumulate in the stalls until there is hardly sufficient room for the horses. This is a pernicious practice, as the decomposing organic matter evolves poisonous gases that are predisposing or exciting causes of disease. When a horse is overheated it is not safe to allow him to

dry by evaporation; rubbing him dry and gradually cooling him out is the wisest treatment. When a horse is hot—covered with sweat—it is dangerous to allow him to stand in a draught; it is the best plan to walk him until his temperature moderates. In such cases a light blanket thrown over the animal may prevent a cold. Overwork or overexertion often causes the most fatal cases of congestion of the lungs. Avoid prolonged or fast work when the horse is out of condition or unaccustomed to it. Animals that have been working out in cold rains should be dried and cooled out, and not left to dry by evaporation. When the temperature of the weather is at the extreme, either of heat or cold, diseases of the organs of respiration are most frequent.

It is not to be supposed that farmers can give their horses the particular attention given to valuable racing and pleasure horses, but they can most assuredly give them common-sense care, and this will often save the life of a valuable or useful animal. Neglect on the part of the owner is as often (perhaps oftener) the cause of disease in the horse as neglect on the part of the servant. If the owner properly considers his interests he will study the welfare of his horses so that he may be able to instruct the servant in details of stable management, as it often happens that the fault on the part of the servant is due to want of knowledge more than to willful neglect.

WOUNDS ABOUT THE NOSTRILS.

Wounds in this neighborhood are common, and are generally caused by getting snagged on a nail or splinter, or by the bite of another horse; or by getting "run into," or by running against something. Occasionally the nostril is so badly torn and lacerated that it is impossible to effect a cure without leaving the animal blemished for life, but in the majority of instances the blemish or scar is due to the want of conservative treatment on the part of the owner or attendant. As soon as possible after the accident the parts should be brought together and held there by stitches. If too much time is allowed to elapse the swelling of the parts will considerably interfere. The skin in this neighborhood is thin and delicate, and therefore it is easy to insert sutures. Never cut away any skin that may be loose and hanging, or else a scar will certainly remain. Bring the parts in direct apposition and place the stitches from a quarter to a half inch apart, as circumstances may demand. It is not necessary to have special surgeons' silk and needles for this operation; good linen thread or ordinary silk thread will answer. The wound afterwards only requires to be kept clean. For this purpose it should be cleansed and discharges washed away daily with a solution made of carbolic acid 1 part, in water 40 parts. If the horse is inclined to rub the wound against some object on account of the irritability, his head should be tied by means of two halter ropes to prevent him rubbing the wound open. The head should be so tied about ten days, except when at work or eating.

TUMORS WITHIN THE NOSTRILS.

As before mentioned, a small globular tumor is sometimes found within the false nostril, under that part of the skin that is seen to puff or rise and fall when a horse is exerted and breathing hard. These tumors contain matter of a cheesy consistency, and are simple. If the tumor is well opened and the matter squeezed out nature will do the rest to perform a perfect cure. If the opening is made from the outside through the skin it should be at the most dependent part, but much the best way to open the tumor is from the inside. Quiet the animal, gently insert your finger up in the direction of the tumor, and you will soon discover that it is much larger inside than it appears to be on the outside. If necessary put a twitch on the ear of the horse to quiet him; run the index finger of your left hand against the tumor; now, with the right hand, carefully insert the knife by running the back of the blade along the index finger of the left hand until the tumor is reached; with the left index finger guide the point of the blade quickly and surely into the tumor; make the opening large; there is no danger; a little blood may flow out for awhile, but it is of no consequence. Squeeze out the matter and keep the part clean.

COLD IN THE HEAD—CATARRH.

Catarrh means a discharge of fluid from the mucous membrane. The form of catarrh under present consideration is at first a congestion, followed by inflammation of the mucous membrane of the nasal chambers—the Schneiderian or pituitary membrane, as it is specifically termed. The inflammation usually extends to the membrane of the sinuses of the head and often to the membrane of the larynx and pharynx, causing the complication of sore throat. Quite frequently the membrane of the eyes is also affected, as evidenced by its congested condition and the flow of tears down over the cheeks; the nasal duct (spoken of before) is lined with a continuation of the same membrane, and hence the inflammation of the membrane of the eyes is only an extension of the disease over a continuous tract, and not a specific disease as often supposed. The membrane of the nasal duct being swollen, the effect of the congestion or inflammation, the tears can not flow freely through it, therefore they escape from the eyes and flow over the cheeks.

Symptoms.—The membrane at the beginning of the attack is dry, congested and irritable; it is of a much deeper hue than natural, pinkish-red or red. Soon a watery discharge from the nostrils makes its appearance; the eyes may also be more or less affected, and tears flow over the cheeks. The animal has some fever, which may be easily detected by placing the finger in the mouth, as the feeling of heat conveyed to the finger will be greater than natural.

To become somewhat expert in ascertaining the changes of temperature in the horse, it is only necessary to place the finger often in the

mouths of horses known to be healthy. After you have become accustomed to the warmth of the mouth of the healthy animal you will have no difficulty in detecting a marked increase of the temperature. Some veterinarians become so expert in this method of examination that they trust to it in preference to the use of thermometers.

The animal may be dull; he frequently emits a sort of sneezing snort, but does not cough unless the throat is affected; he expels the air forcibly through his nostrils very often in a manner that may be aptly called "blowing his nose." A few days after the attack begins the discharge from the nostrils changes from a watery to that of a thick mucilaginous state, of a yellowish-white color, and may be more or less profuse. Often the appetite is lost, and the animal becomes debilitated.

Treatment.—This disease is not serious, but inasmuch as neglect or bad treatment may cause it to run into a dangerous complication, it should receive proper attention. The animal should not be worked for a few days. A few days of quiet rest, with pure air and good food, will be of greater benefit than medication administered while the horse is excited and exposed to draughts and changes of temperature. The benefit derived from the inhalation of steam can not be overestimated. This is effected by holding the horse's head over a bucketful of boiling water so that the animal will be compelled to inhale steam with every inhalation of air. Stirring the hot water with a wisp of hay causes the steam to arise in greater abundance. By no means adopt the pernicious method of steaming—advised by some authors and practiced by many people—by putting the head in a bag with hot water or scalded bran. Common sense would be sufficient to condemn the method, if those who practice it would only think. With the head so closely confined in the bag the horse is compelled to inhale over and over the foul air expelled from the lungs. This is malpractice on a healthy horse, and much worse when the animal is ill, for then it has a greater necessity for pure air.

The horse should be made to inhale steam four or five times a day, about fifteen or twenty minutes each time.

Particular attention should be paid to the diet. Give bran mashes, scalded oats, linseed gruel, and grass if in season. If the horse evinces no desire for this soft diet, it is well to allow any kind of food he will eat, such as hay, oats, corn, etc.

If the animal is constipated, relieve this symptom by injections (enemas) of warm water into the rectum (last gut) three or four times a day, but under no circumstances administer purgative medicines.

For simple cases the foregoing is all that is required, but if the appetite is lost, and the animal appears debilitated and dull, give 3 ounces of the solution of acetate of ammonia and 2 drams of powdered chlorate of potassium diluted with a pint of water three times a day as a drench. Be careful when giving the drench; do not pound the horse

on the gullet to make him swallow; be patient, and take time, and do it right.

If the weather be cold, blanket the animal and keep him in a comfortable stall. If the throat is sore, treat as advised for that ailment, to be described hereafter.

When the inflammatory symptoms subside and the appetite is not regained, give 2 ounces each of the tincture of gentian and spirits of nitrous ether in a pint of water, as a drench, every night and morning for several days. If, after ten days or two weeks, the discharge from the nostrils continues, give 1 dram of powdered sulphate of iron three times a day. This may be mixed with bran and oats, if the horse will eat it, but if he will not eat the food with the iron in it, give the iron as a drench, dissolved in a pint of water.

It may be objected that rather more space than necessary is devoted to this simple affection; but when it is known that there is a tendency to the extension of the trouble, and that serious complications may ensue, the fact should be appreciated that there is every reason why the common cold should be thoroughly understood and intelligently treated in order to prevent the more dangerous diseases.

CHRONIC CATARRH—NASAL GLEET.

This is a subacute or chronic inflammation of some part of the membrane affected in common cold, the disease just described. It is manifested by a persistent discharge of a thick, white, or yellowish-white matter from one or both nostrils. The sinuses of the head are the usual seat of the disease. The commonest cause is a neglected or badly treated cold, and it usually follows those cases where the horse has suffered exposure, been overworked, or has not received proper food, and, as a consequence, has become debilitated.

Other but less frequent causes for this affection are: Fractures of the bones that involve the membrane of the sinuses; and even blows on the head over the sinuses, of sufficient force to rupture blood-vessels within. The blood thus escaping into the sinus acts as an irritant, and sets up an inflammation. Diseased teeth often involve a sinus, and cause a fetid discharge from the nostril. Violent coughing is said to have forced particles of food into the sinus, which acted as a cause of the disease. Tumors growing in the sinuses are known to have caused it. It is also attributed to matter from disease of the turbinated bones. Absorption of the bones forming the walls of the sinuses has been caused by the pressure of pus collecting in them, and by tumors filling up the cavity.

Symptoms.—The long-continued discharge, which varies in quantity according to the attendant circumstances—the cause of the trouble and the part affected—will invariably indicate the disease. Great caution must be exercised when examining these cases, as horses have been condemned as glandered when really there was nothing more ailing

them than nasal gleet. This affection is not contagious, nor is it dangerous, although difficult to cure in some instances. In most cases the discharge is from one nostril only, which signifies that the sinuses on that side of the head are affected. The discharge may be intermittent, that is, quantities may be discharged at times, and again little or none for a day or so. The glands under and between the bones of the lower jaw may be enlarged. The peculiar ragged-edged ulcer of glanders is not to be found on the membrane within the nostrils, but occasionally sores are to be seen there. If there is any doubt about it, you should study well the symptoms of glanders to enable you to be at least competent to form a safe opinion.

The eye on the side of the discharging nostril may have a peculiar appearance and look smaller than its fellow. There may be an enlargement, having the appearance of a bulging out of the bone over the part affected, between or below the eyes. The breath may be offensive, which indicates decomposition of the matter or bones, or, especially, disease of the teeth. A diseased tooth is further indicated by the horse holding his head to one side when eating, or dropping the food from the mouth after partly chewing it. When you tap on the bones between the eyes, below the eyes and above the back teeth of the upper jaw, a hollow drum-like sound is emitted, but if the sinus is filled with pus or contains a large tumor the sound emitted will be the same as if a solid substance were struck; by this means the sinus affected may be located in some instances. The hair may be rough over the affected part, or even the bone may be soft to the touch and the part give somewhat to pressure, or leave an impression where it is pressed upon with the finger.

Treatment.—The cause of the trouble must be ascertained before treatment is commenced. In the many cases where the animal is in poor condition (in fact in all cases), he should have the most nutritive food and regular exercise. The food, or box containing it, should be placed on the ground, as the dependent position of the head favors the discharge.

The cases that do not require a surgical operation must, as a rule, have persistent medical treatment. Mineral tonics are of the most value. For eight days give the following mixture: Sulphate of iron, 3 ounces; powdered nux vomica, 1 ounce; mix and make into sixteen powders. Give one powder mixed with the food twice a day. When all of the foregoing has been administered the following may be tried for eight days: Sulphate of copper, 4 ounces; powdered gentian, 6 ounces; mix and divide into sixteen powders. Give one on the food twice a day. If the animal will not eat the powder on the food, put the medicine in a pint of water in a bottle, shake well and give as a drench. After this substitute the following: One dram of iodide of potassium dissolved in a bucketful of drinking water, one hour before each meal. Much benefit is often derived from the effect of a blister over the face.

The ordinary fly blister plaster of the drug store mixed with one third its weight of lard is efficient. Sulphur burnt in the stable while the animal is there to inhale its fumes is also a valuable adjunct. Care should be taken that the fumes of the burning sulphur are sufficiently diluted with air, so as not to suffocate the horse. Chloride of lime sprinkled around the stall is good. Also keep a quantity of the chloride under the hay in the manger so that the gases will be inhaled as the horse holds his head over the hay while eating. Keep the nostrils washed; the discharges may be washed away for appearance sake, but squirting solutions up the nose is worse than useless, as they do not come in contact with the diseased part.

If the nasal gleet is the result of a diseased tooth the tooth must be removed, and the subsequent treatment will be according to indications. The operation of trephining is the best possible way to remove the tooth in such cases, as it immediately opens the cavity which can be attended to direct.

In all those cases of nasal gleet where sinuses contain either collections of pus or tumors, the only relief is by the trephine; and it is a fact that, no matter how thoroughly described, this is an operation that will be very seldom attempted by the non-professional, although the operation is simple and attended in the majority of instances with success. It would therefore be a useless waste of time to give the *modus operandi*.

An abscess involving the turbinated bones is similar to the collection of pus in the sinuses, and must be relieved by trephining.

THICKENING OF THE MEMBRANE.

This is sometimes denoted by a chronic discharge, a snuffling in the breathing and a contraction of the nostril. It is a result of common cold and requires the same treatment as prescribed for nasal gleet, viz, the sulphate of iron, sulphate of copper, iodide of potassium, etc. The membranes of both sides may be affected, but one side only is the rule; and the affected side may be easily detected by holding the hand tightly over one nostril at a time. When the healthy side is closed in this manner, the breathing through the affected side will demonstrate a decreased caliber or an obstruction.

NASAL POLYPUS.

Tumors with narrow bases (somewhat pear-shaped) are occasionally found attached to the membrane of the nasal chambers, and are obstructions to breathing through the side in which they are located. They vary much in size; some are so small that their presence is not manifested, while others almost completely fill up the chamber, thereby causing a serious obstruction to the passage of air. The pedicel of the tumor is generally attached high up in the chamber, and usually the

tumor can not be seen, but occasionally it increases in size until it can be observed within the nostril. Sometimes, instead of hanging down towards the nasal opening, it falls back into the pharynx. It causes a discharge from the nostril, a more or less noisy snuffling sound in breathing, according to its size, a discharge of blood (if it is injured), and sneezing.

The side that it occupies can be detected in the same way as described for the detection of the affected side when the breathing is obstructed by a thickened membrane.

The only relief is removal of the polypus, which, like all other operations, should be done by an expert when it is possible to secure one. The operation is performed by grasping the base of the tumor with suitable forceps and twisting it round and round until it is torn from its attachment. The resulting hemorrhage is checked by the use of an astringent lotion, such as a solution of the tincture of iron, etc.

PHARYNGEAL POLYPUS.

This is exactly the same kind of tumor described as nasal polypus, the only difference being in the situation. Indeed, the pedicel of the tumor may be attached to the membrane of the nasal chamber as before explained, or it may be attached in the fauces (opening of the back part of the mouth) which is often the case, and by the body of the tumor falling into the pharynx it gets the name of pharyngeal polypus. In this situation it may seriously interfere with breathing. Sometimes it drops into the larynx, causing the most alarming symptoms. The animal coughs or tries to cough, saliva flows from the mouth, the breathing is performed with the greatest difficulty and accompanied by a loud noise; the animal appears as if strangled and often falls exhausted. When the tumor is coughed out of the larynx the animal regains quickly and soon appears as if nothing was ailing. These sudden attacks and quick recoveries should lead to a detection of the trouble. The examination must be made by holding the animal's mouth open with a balling iron or speculum and running the hand back into the mouth. If the tumor is within reach it must be removed with forceps by torsion, and the hemorrhage controlled as before advised.

BLEEDING FROM THE NOSE.

This often occurs during the course of certain diseases, viz., influenza, bronchitis, purpura hemorrhagica, glanders, etc. But it also occurs independent of other affections; and, as before mentioned, is a symptom of polypus or tumor in the nose.

Injuries to the head, exertion, violent sneezing—causing a rupture of a small blood-vessel—also induce it. The bleeding is almost invariably from one nostril only, and is never very serious. The blood escapes in drops (very seldom in a stream), and is never frothy as when

the hemorrhage is from the lungs. (See Bleeding from the lungs.) In most cases, bathing the head and washing out the nostril with cold water is all that is necessary. If the cause is known you will be guided according to circumstances. If the bleeding continues, pour ice-cold water over the face, between the eyes and down over the nasal chambers. A bag containing ice in small pieces applied to the head is often efficient. If in spite of these measures the hemorrhage continues, try plugging the nostrils with cotton, tow, or oakum. Tie a string around the plug before it is pushed up into the nostril, so that it can be safely withdrawn after four or five hours. If both nostrils are bleeding plug only one nostril at a time. If the hemorrhage is profuse and persistent give a drench composed of 1 dram of acetate of lead dissolved in a pint of water; or 1 dram gallic acid dissolved in a pint of water may be tried.

INFLAMMATION OF THE PHARYNX.

As already stated, the pharynx is common to the functions of both respiration and alimentation. From this organ the air passes into the larynx and thence onward to the lungs. In the posterior part of the pharynx is the superior extremity of the gullet, the canal through which the food and water pass to the stomach. Inflammation of the pharynx is a complication of other diseases, viz., influenza, strangles, etc., and is probably always, more or less, complicated with inflammation of the larynx. That it may exist as an independent affection there is no reason to doubt, but so closely do the symptoms resemble those of laryngitis, and as the treatment is the same as for the latter disease, it is unnecessary to give it further consideration in a separate article.

SORE THROAT—LARYNGITIS.

The larynx is situated in the space between the lower jaw bones just back of the root of the tongue, and is retained in this position by the windpipe, muscles, and bones to which it is attached. It may be considered as a box (somewhat depressed on each side), composed principally of cartilages and small muscles, and lined on the inside with a continuation of the respiratory mucous membrane. Posteriorly it opens into and is continuous with the windpipe. It is the organ of the voice, the vocal cords being situated within it; but in the horse this function is of little or no consequence. It dilates and contracts to a certain extent like the nostrils, thus regulating the volume of air passing through it. The mucous membrane lining it internally is so highly sensitive that if the smallest particle of food happens to drop into it from the pharynx the muscles instantly contract and violent coughing ensues, which is continued until the source of irritation is ejected. This is a wise provision of nature to prevent foreign substances gaining access to the lungs. That projection called Adam's apple in the neck of man is the prominent part of one of the cartilages forming the larynx.

Inflammation of the larynx is a serious and sometimes a fatal disease, and, as before stated, is usually complicated with inflammation of the pharynx, constituting what is popularly known as "sore throat."

Symptoms.—About the first symptom noticed is the cough, followed by a difficulty in swallowing, which may be due to the soreness of the membrane of the pharynx, over which the food or water must pass, or to the pain caused by the contraction of the muscles necessary to impel the food or water onward to the gullet; or this same contraction of the muscles may cause a pressure on the larynx and produce the pain. In many instances the difficulty in swallowing is so great that the water, and in some cases the food, is returned through the nose. The mouth is hot, and saliva dribbles from it. The glands between the lower jaw bones and below the ears may be swollen. Pressure on the larynx induces a violent fit of coughing. The cough is very characteristic; it is easily seen that the animal is "coughing at his throat." The head is more or less "poked out," and has the appearance of being stiffly carried. The membrane in the nose becomes red. A discharge from the nostrils soon appears. As the disease advances, the breathing may assume a more or less noisy character; sometimes a harsh rasping snore is emitted with every respiration, the breathing becomes hurried, and occasionally the animal seems threatened with suffocation.

Treatment.—In all cases steam the nostrils as advised for cold in the head. In bad cases cause the steam to be inhaled continuously for hours, until relief is afforded. Have a fresh bucketful of boiling water every fifteen or twenty minutes. In each bucketful of water put a tablespoonful of oil of turpentine, which will be carried along with the steam to the affected parts and have a beneficial effect. In mild cases steaming the nostrils five, six, or seven times a day will suffice.

The animal should be placed in a comfortable, dry stall (a box-stall preferred), but should have a pure atmosphere to breathe. The body should be blanketed, and bandages applied to the legs. The diet should consist of soft food—bran mashes, scalded oats, linseed gruel, and, best of all, grass, if in season, which should be carried to him as soon as cut, and a fresh supply offered often. The manger or trough should not be too high nor too low, but a temporary one should be constructed at about the height he carries his head. Having to reach too high or too low may cause so much pain that the animal would rather forego satisfying what little appetite he might have, than inflict pain by craning his head for food or water. A supply of fresh water should be before him all the time; he will not drink too much, nor will the cold water hurt him. Constipation (if present) must be relieved by enemas of warm water, administered three or four times during the twenty-four hours.

A liniment composed of 2 ounces of olive oil and 1 ounce each of solution of ammonia and tincture of cantharides, well shaken together, should be thoroughly rubbed in about the throat from ear to ear, and

about 6 inches down over the windpipe and in the space between the lower jaws. This liniment should be applied once a day for two or three days.

When the animal can swallow without much difficulty, give the following preparation: Fluid extract hyoscyamus 1 dram, powdered chlorate potassium 2 drams, simple sirup or molasses 2 ounces. Mix all together and drench very carefully. Repeat the dose every six hours.

If the animal is breathing with great difficulty do not attempt to drench him, but persevere in steaming the nostrils, and dissolve 2 drams of chlorate of potassium in every gallon of water he will drink; even if he can not swallow much of it (and even if it is returned through the nostrils), it will be of some benefit as a gargle to the pharynx.

When the breathing begins to be loud great relief is afforded in some cases by giving a drench composed of 2 drams of fluid extract of jaborandi in half a pint of water. If benefit is derived, this drench may be repeated four or five hours after the first dose is given. It will cause a free flow of saliva from the mouth within thirty minutes.

In urgent cases, when suffocation seems inevitable, the operation of tracheotomy must be performed. It must be admitted that this operation appears to be (to the non-professional) a very formidable one, but as it is certainly a means of saving life where all other measures have failed, it is the duty of the writer to describe it. To describe this operation in words that would make it comprehensible to the general reader is a much more difficult task than performing the operation, which in the hands of the expert is one of the simplest, and attended with less danger (from the operation itself) than any of the special operations on organs.

The operator should be provided with a tracheotomy tube (to be purchased from any veterinary instrument maker) and a sharp knife, a sponge, and a bucket of clean cold water. The place to be selected for opening the windpipe is that part which is found, upon examination, to be least covered with muscles. Run your hand down the front part of the windpipe and you may easily detect the rings of cartilage of which it is composed; about 5 or 6 inches below the throat it will be the most plainly felt. Right here, then, is the place to cut through. Have an assistant hold the animal's head still; no necessity of putting a twitch on the nose. Grasp your knife firmly in the right hand, select the spot to cut, *and cut.* Make the cut from above to below directly on the median line on the anterior surface of the windpipe. Do not attempt to dissect your way in, that is too slow, it annoys the horse and makes him restless, and besides it gives a novice time to become nervous. Make the cut about 2 inches long *in the windpipe;* this necessitates cutting three or four rings. One bold, nervy stroke is usually sufficient, but if it is necessary to make several other cuts to finish the operation do not hesitate. Your intention must be to make a hole in the windpipe sufficiently large to admit the tracheotomy tube,

and you have not accomplished your purpose until you have done so. It is quickly manifested when the windpipe is severed, the hot air rushes out, and when air is taken in it is sucked in with a noise. A slight hemorrhage may result (it never amounts to much), which is easily controlled by washing the wound with a sponge and cold water; do not get any of the water in the windpipe. Do not neglect to instruct your assistant to hold the head down immediately after the operation, so that the neck will be in a horizontal line. This will prevent the blood getting into the windpipe and allow it to drop directly on the ground. If you have the self-adjustable tube, it retains its place in the wound without further trouble after it is inserted. The other kind requires to be secured in position by means of two tapes or strings tied around the neck. After the hemorrhage is somewhat abated sponge the blood away and see that the tube is thoroughly clean, then insert it, directing the tube downwards towards the lungs. To insure the tube being clean, it is best to keep it immersed in a solution of 1 ounce of carbolic acid in 20 ounces of water for about thirty minutes previous to inserting it in the windpipe.

The immediate relief this operation affords is wonderful to behold. The animal, a few minutes before on the verge of death from suffocation, emitting a loud wheezing sound with every breath; with haggard countenance, body swaying, pawing, gasping, fighting for breath, is now breathing tranquilly, and ten to one is nosing about the stall in search of something to eat.

The tube should be removed once a day and cleaned with the carbolic acid solution (1 to 20), and the discharge washed away from the wound with a solution of carbolic acid, 1 part to 40 parts water. Several times a day the hand should be held over the opening in the tube to test the animal's ability to breathe through the nostrils, and as soon as it is demonstrated that breathing can be performed in the natural way the tube should be removed, the wound thoroughly cleansed with the carbolic acid solution (1 to 40), and closed by inserting four or five stitches *through the skin and muscle.* Do not include the cartilages of the windpipe in the stitches. Apply the carbolic acid solution to the wound three or four times a day until healed. When the tube is removed to clean it the lips of the wound may be pressed together to ascertain whether or not the horse can breathe through the larynx. The use of the tube should be discontinued as soon as possible.

It is true that tracheotomy tubes are seldom to be found on farms, and especially when most urgently required. In such instances there is nothing left to be done but, with a strong needle, pass a wax end or other strong string through each side of the wound, including the cartilage of the wind-pipe, and keep the wound open by tying the strings over the neck. The operation of tracheotomy is not always successful in saving the animal's life, and the principal reason of this is, that it is deferred too long and the animal is beyond recovery before it is attempted.

During the time the tube is used the other treatment advised must not be neglected. After a few days the discharge from the nostrils becomes thicker and more profuse. This is a good symptom and signifies that the acute stage has passed. At any time during the attack, if the horse becomes weak, give the following drench every four or five hours: Spirits of nitrous ether, 2 ounces; rectified spirits, 2 ounces; water, 1 pint. When the power of swallowing is regained and the profuse discharge of thick, yellowish-white matter from the nostrils announces the fact of the convalescing stage, administer the following: Tincture of the perchloride of iron, 1 ounce; tincture of gentian, 2 ounces; water, 1 pint. This should be given every morning and evening for about a week or ten days. Good nutritive food must now be given—hay, oats, and corn. Do not be in a hurry to put the animal back to work, but give plenty of time for a complete recovery. Gentle and gradually increasing exercise may be given as soon as the horse is able to stand it.

If abscesses form in connection with the disease they must be opened to allow the escape of pus, but do not rashly plunge a knife into swollen glands; wait until you are certain the swelling contains pus. The formation of pus may be encouraged by the constant application of poultices for hours at a time. The best poultice for the purpose is made of linseed meal, with sufficient hot water to make a thick paste. If the glands remain swollen for some time after the attack, rub well over them an application of the following: Biniodide of mercury, 1 dram; lard, 1 ounce; mix well. This may be applied once every day until the part is blistered.

Sore throat is also a symptom of other diseases, such as influenza, strangles, purpura hemorrhagica, etc., which diseases may be consulted under their proper headings.

After a severe attack of inflammation of the larynx the mucous membrane may be left in a thickened condition, or an ulceration of the part may ensue, either of which are liable to produce a chronic cough. For the ulceration it is useless to prescribe, because it can neither be diagnosed nor topically treated by the non-professional.

If a chronic cough remains after all the other symptoms have disappeared, it is advisable to give 1 dram of iodide of potassium dissolved in a bucketful of drinking water one hour before feeding, three times a day, for a month if necessary. Also rub in well the preparation of iodide of mercury (as advised for the swollen glands) about the throat, from ear to ear, and in the space between the lower jaw bones. The application may be repeated every third day until the part is blistered.

SPASM OF THE LARYNX.

This has been described by some authorities. The symptoms given are: Sudden seizure by a violent fit of coughing; the horse may reel and fall, and after a few minutes recover, and be as well as ever. The

treatment recommended is: Give a pint of linseed oil and after it has operated administer 3 drams of bromide of potassium three times a day, dissolved in the drinking water, or give as a drench in about a half pint of water, for a week. Then give a dram of powdered nux vomica (either on the food or shaken with water as a drench) once a day for a few weeks.

CROUP AND DIPHTHERIA.

Both of these diseases, it is claimed, affect the horse. But such cases must be rare, as veterinarians of extended experience have failed to recognize a single case in their practice. The symptoms are so much like those of inflammation of the larynx that it would be impossible for the general reader to discriminate between them.

ROARING.

Horses that are affected with a chronic disease that causes a loud unnatural noise in breathing are called "roarers." This class does not include those affected with severe sore throat, as in these cases the breathing is noisy only during the attack of the acute disease.

Roaring is caused by an obstruction to the free passage of the air in some part of the respiratory tract. Nasal polypi, thickening of the membrane, pharyngeal polypi, deformed bones, paralysis of the wing of the nostril, etc., are occasional causes. The noisy breathing of horses after having been idle and put to sudden exertion is not due to any disease, and is only temporary. Very often a nervous, excitable horse will make a noise for a short time when started off, generally caused by the cramped position in which the head and neck are forced, in order to hold him back.

Many other causes may occasion temporary, intermitting or permanent noisy respiration, but after all other causes are enumerated it will be found that more than nine out of ten cases of chronic roaring are caused by paralysis of the muscles of the larynx; and almost invariably it is the muscles of the left side of the larynx that are affected.

In chronic roaring the noise is made when the air is drawn into the lungs; and only when the disease is far advanced is a sound produced when the air is expelled, and even then it is not near so loud as during inspiration.

In a normal condition the muscles dilate the aperture of the larynx by moving outward the cartilage and vocal cord, allowing a sufficient volume of air to rush through. But when the muscles are paralyzed, the cartilage and vocal cord that are normally controlled by the affected muscles remain stationary; therefore when the air rushes in it meets this obstruction, and the noise is produced. When the air is *expelled from the lungs* its very force pushes the cartilage and vocal cords out, and consequently noise is not always produced in the expiratory act.

The paralysis of the muscles is due to derangement of the nerve that supplies them with energy. The muscles of both sides are not supplied by the same nerve; there is a right and a left nerve, each supplying its respective side. The reason why the muscles on the left side are the ones usually paralyzed is owing to the difference in the anatomical arrangement of the nerves. The left nerve is much longer and more exposed to interference than the right nerve. This pair of nerves is given off from its parent trunks (the pneumogastrics) after the latter enter the chest, and consequently they are called the recurrent laryngeal nerves, on account of having to recur to the larynx.

In chronic roaring there is no evidence of any disease of the larynx, other than the wasted condition of the muscles in question. The disease of the nerve is generally located far from the larynx. Disease of parts contiguous to the nerve along any part of its course may interfere with its proper function. It is not really necessary for the nerve itself to be the seat of disease; pressure upon it is sufficient; the pressure of a tumor on the nerve is a common cause. Disease of lymphatic glands within the chest through which the nerve passes on its way back to the larynx is the most frequent interruption of nervous supply, and consequently roaring. When roaring becomes confirmed medical treatment is entirely useless, as it is impossible to restore the wasted muscle and at the same time remove the cause of the interruption of the nervous supply. Before the disease becomes permanent it may be benefited by a course of iodide of potassium, when it is caused by disease of the lymphatic glands. Electricity has been used with indifferent success. Blistering or firing over the larynx is of course not worthy of trial if the disease is due to interference with the nerve supply. The administration of strychnia (nux vomica) on the ground that it is a nerve tonic, with the view of stimulating the affected muscles, is treating only the result of the disease without considering the cause, and is therefore useless. The operation of extirpating the collapsed cartilage and vocal cord is believed to be the only relief, and as this operation is critical and can only be performed by the skillful veterinarian, it will not be described here.

From the foregoing description of the disease it will be seen that the name "roaring," by which the disease is generally known, is only a symptom and not the disease. Chronic roaring is also in many cases accompanied by a cough. The best way to test whether a horse is a "roarer" is to either make him pull a load rapidly up a hill or over a sandy road or soft ground; or if he is a saddle horse gallop him up a hill. The object is to make him exert himself. Some horses require a great deal more exertion than others before the characteristic sound is emitted. The greater the distance he is forced the more he will appear exhausted if he is a roarer; in bad cases the animal becomes utterly exhausted, the breathing is rapid and difficult, the nostrils dilate to the fullest extent, and the animal appears as if suffocation was imminent.

An animal that is a roarer should not be used for breeding purposes, no matter how valuable the stock. The taint is transmissible in many instances, and there is not the least doubt in the minds of those who know best that the offspring whose sire or dam is a roarer is born with an hereditary predisposition to the affection.

Grunting.—A common test used by veterinarians when examining "the wind" of a horse is to see if he is a "grunter." This is a sound emitted during expiration when the animal is suddenly moved, or startled, or struck at. If he grunts he is further tested for roaring. Grunters are not always roarers, but as it is a common thing for a roarer to grunt such an animal must be looked upon with suspicion until he is thoroughly tried by pulling a load or galloped up a hill. The test should be a severe one. Horses suffering with pleurisy, pleurodynia, or rheumatism, and other affections accompanied with much pain, will grunt when moved, or when the pain is aggravated, but grunting under these circumstances does not justify the term of "grunter" being applied to the horse, as the grunting ceases when the animal recovers from the disease that causes the pain.

High blowing.—This term is applied to a noisy breathing made by some horses. It is distinctly a nasal sound, and must not be confounded with "roaring." The sound is produced by the action of the nostrils. It is a habit and not an unsoundness. Contrary to roaring, when the animal is put to severe exertion the sound ceases. An animal that emits this sound is called a "high-blower." Some horses have, naturally, very narrow nasal openings, and they may emit sounds louder than usual in their breathing when exercised.

Whistling is only one of the variations of the sound emitted by a horse called a "roarer," and therefore needs no further notice, except to remind the reader that a whistling sound may be produced during an attack of severe sore throat or inflammation of the larynx, which passes away with the disease that causes it.

Thick wind.—This is another superfluous term applied to a symptom. The great majority of horses called "thick-winded" belong either in the class called "roarers," or are affected with "heaves," and therefore no separate classification is needed. Mares heavy with foal, horses excessively fat, and those that have not been exercised for so long that the muscular system has become unfit for work; horses with large bellies, and, especially, when the stomach is loaded with coarse, fibrous, or bulky food, emit a louder sound than natural in their breathing, and are called "thick-winded." The treatment in such cases is obvious: "Remove the cause and the effect will cease." While it must be admitted that "thickening of the mucous membrane of the finer bronchial tubes and air cells may cause the breathing called thick-winded," it must at the same time be admitted that there is no symptom by which the condition can be distinguished from what will hereafter be described as "heaves," by the general reader, at least.

THE WINDPIPE.

The windpipe, or trachea, as it is technically called, is the flexible tube that extends from the larynx which it succeeds at the throat to above the base of the heart in the chest, where it terminates by dividing into the right and left bronchi, the tubes going to the right and left lung respectively. The windpipe is composed of about fifty incomplete rings of cartilage united by ligaments. A muscular layer is situated on the superior surface of the rings. Internally the tube is lined with a continuation of the mucous membrane that lines the entire respiratory tract, which here has very little sensibility in contrast to that lining the larynx, which is endowed with exquisite sensitiveness.

The windpipe is not subject to any special disease, but is more or less affected during laryngitis (sore throat), influenza, bronchitis, etc., and requires no special treatment. The membrane may be left in a thickened condition after these attacks. One or more of the rings may be accidentally fractured, or the tube may be distorted or malformed, the result of violent injury. After the operation of tracheotomy it is not uncommon to find a tumor or malformation as a result or sequel of the operation. In passing over this section attention is merely called to these defects, as they require no particular attention in the way of treatment. However, it may be stated that any one of the before-mentioned conditions may constitute one of the causes of noisy respiration described as "roaring."

GUTTURAL POUCHES.

These two sacks are not included in the organs of respiration, but sometimes pus collects in them to an extent that considerably interferes with respiration. They are in close proximity to the pharynx and larynx, and when filled with matter the functions of the last-named organs can not be properly performed. They are situated above the throat, and communicate with the pharynx, as well as with the cavity of the tympanum of the ear. They are peculiar to solipeds. They contain air, except when filled with pus. Their function is unknown.

One or both guttural pouches may contain pus. The symptoms are: Swelling on the side below the ear and an intermittent discharge of matter from one or both nostrils, especially when the head is depressed.

The swelling is soft, and, if pressed upon, matter will escape from the nose if the head is depressed. As before mentioned, these pouches communicate with the pharynx, and through this small opening matter may escape. A recovery is probable if the animal is turned out to graze, or if he is fed from the ground, as the dependent position of the head favors the escape of matter from the pouches. In addition to this, give the tonics recommended for nasal gleet. If this treatment fails an operation must be performed, which should not be attempted by any one unacquainted with the anatomy of the part.

METHODS OF EXAMINATION FOR DISEASES HAVING THEIR SEAT WITHIN THE CHEST.

To lay down a set of rules for the guidance of the general reader in discriminating between the different affections of the organs of respiration situated in the thoracic cavity, is a task hard to accomplish. In the first place, it is presumed that the reader has no knowledge whatever of the anatomical arrangement, and probably but a meager idea of the physiology of the organs, therefore the use of technical language, which would make the task a simple one, is out of the question. And, to one who scarcely understands the signs and laws of health, it is difficult to convey in comprehensive language, in an article like this, an adequate idea of the great importance attached to signs or symptoms of disease. Then, again, the methods used for the detection of symptoms not visible are such as require special cultivation of the particular senses brought into play. It will be the endeavor of the writer, when describing the symptoms of each particular disease, to do so in such manner that a serious mistake should not be made; but for the benefit of those who may desire a more thorough understanding of the subject a brief review of the various methods employed and an explanation of certain symptoms will be given here.

Pulse.—By the pulse is meant the beating of the arteries, which follows each contraction of the heart. The artery usually selected in the horse for "taking the pulse" is the submaxillary where it winds around the lower jaw-bone. On the inner side of the jaw-bone the artery may be readily felt and pressed against the bone, hence its adaptability for the purpose of detecting each peculiarity. The number of beats in a minute, the regularity, the irregularity, the strength or feebleness, and other peculiarities are principally due to the action of the heart.

In the healthy horse the average number of beats in a minute is about forty; but in different horses the number may vary from thirty-five to forty-five and still be consistent with health. The breed and temperament of an animal has much to do with the number of pulsations. In a thoroughbred the number of beats in a given time is generally greater than in a coarse-bred horse. The pulse is less frequent in a dull plethoric animal than in an excitable one. The state of the pulse should be taken when the animal is quiet and at rest. Work, exercise, and excitement increase the number of pulsations. If the pulse of a horse be taken while standing quietly in the stable it will be found less frequent than when he is at pasture.

It is not within the scope of a work of this kind to give all the peculiarities of the pulse; only a few of the most important will be noticed. It should, however, be stated that if the reader would learn something of the pulse in disease he must first become acquainted with the pulse in health; he must know the natural peculiarities before he can detect the deviations caused by disease.

By a *frequent pulse* is meant an increased number of beats in a given time. An *infrequent pulse* means the reverse. A *quick pulse* refers to the time occupied by the individual pulsation. The beat may strike the finger either *quickly* or *slowly*. Hence the pulse may beat forty *quick* pulsations or forty *slow* pulsations in a minute.

The pulse is called *intermitting* when the beat now and then is omitted. The omission of the beat may be at the end of a given number of pulsations, when it is termed regularly intermittent, or it may be irregularly intermittent.

A *large pulse* means that the volume is larger than usual, and a *small pulse* means the opposite. When the artery is easily compressed and conveys the feeling of emptiness it is called a *feeble pulse*. When a feeling of hardness and resistance is conveyed to the finger it is termed a *hard pulse*. A *double pulse* is when the beat seems to give two rapid beats at once. Besides other peculiarities the pulse may include the character of two or more of the foregoing classes.

In fever the pulse is modified, both as regards frequency and other deviations from the normal standard. When a horse is quietly standing at rest, if the pulse beats fifty-five or more in a minute, fever is present.

Temperature.—The temperature of the healthy horse ranges from about 99½° to 101½° F. The average may be placed at about 100° F. The temperature is subject to slight alterations by certain influences. A high surrounding temperature increases the animal temperature, and cold the reverse. Exercise increases it. Mares have a higher temperature than males. Drinking cold water lowers the animal temperature. It is higher in the young than in the old. The process of digestion increases the temperature.

The most accurate method of taking the temperature is by introducing a registered clinical thermometer into the rectum. This instrument can be purchased from any dealer in surgical instruments. Even the best made may vary somewhat from being exact, but one sufficiently true for the purpose is easily obtained. It should be self-registering. The thermometer should remain in the gut for about three or four minutes. Before inserting it you should be sure the mercury is below the minimum temperature. The end containing the mercury should be pushed in gently, leaving only sufficient outside to take hold of when you desire to withdraw it.

In describing the symptoms of "cold in the head" the method of ascertaining an increase of temperature by placing the finger in the mouth is referred to. The method requires considerable practice and a delicacy of touch to become expert, but, when a thermometer is not at hand, a little practice will enable a person of ordinary intelligence to detect the existence or absence of fever.

Respiration.—In health, standing still, the horse breathes from twelve to fifteen times a minute; work or excitement increases the number of respirations.

The character of the breathing is changed by disease. *Quick breathing* refers to an increased number of respirations, which may be due to disease or to simple exercise. *Difficult breathing* is always associated with something abnormal, and is often a perfect guide to the trouble. *Stertorous breathing* must not be confounded with the difficult breathing or noisy respiration of sore throat, roaring, etc. By stertorous breathing is meant what, in the human being, is called snoring, which is due to a relaxation of the palate and not to disease of the part. In the horse it is generally associated with brain disease, when the consequent derangement of the nervous functions causes the relaxation of the soft palate. *Abdominal breathing* is when the ribs are kept as nearly stationary as possible, and the abdominal muscles assist to a much greater extent than natural in respiration; the abdomen is seen to work like a bellows. In pleurisy, owing to the pain caused by moving the ribs, this kind of breathing is always present. *Thoracic breathing* is the opposite of abdominal breathing—that is, the ribs rise and fall more than usual, while the abdominal muscles remain fixed; this is due to abdominal pain, such as peritonitis, etc. *Irregular breathing* is exemplified in "heaves," and often during the critical stages of acute diseases.

Secretions.—In the first stages of inflammatory disease these functions are noticed with benefit. For instance, in the common cold at the beginning of the attack the membrane within the nostrils is dry and congested, which state gradually gives way to a watery discharge, soon followed by a thick mucus. In pleurisy the surfaces are at first dry, which can be easily ascertained by placing the ear against the chest over the affected part, when the dry surfaces of the pleuræ will be heard rubbing against each other, producing a sound likened to that of rubbing two pieces of paper one against the other. In diseases of the respiratory organs the bowels are usually constipated, and the urine becomes less in quantity and of a higher color. The skin is usually hot and dry, but there are instances when perspiration is profuse. At the beginning of the attack there is generally a chill (in most instances unnoticed by the attendant), caused by the contraction of the blood-vessels in the skin driving the blood internally.

Cough.—This is usually a violent effort to remove some source of irritation in the respiratory tract. The *dry cough* is heard during the first stages of disease of the respiratory organs. In pleurisy the cough is a dry one. The cough in pleurisy is noticeable on account of the apparent effort of the animal to suppress it. The *moist cough* is heard when the secretions (following a dry stage) are re-established. Cough is but a symptom—the effect of a disease. Roaring, heaves, pleurisy, pneumonia, etc., have a cough peculiar to each affection.

Auscultation.—This term is applied to the method of detecting diseases of the organs within the chest by listening to the sounds. Generally the ear is placed directly against the part, but occasionally

an instrument called the stethoscope is employed. The former is the best mode for horses. In order to gain any satisfaction or knowledge by the practice of this method the reader must first become familiar with the sounds in a healthy horse, which can only be learned by practice. Much more practice and knowledge are then required to discriminate properly between abnormal sounds and their significance.

Percussion.—As applied to the practice of medicine this term refers to the act of striking on some part of the body to determine the condition of the internal organs by the sound elicited. If a wall of a cavity is struck the sound is easily distinguished from that emitted when a solid substance is knocked on. When percussing the chest, the ribs are struck with the tips of the fingers and thumb held together, or with the knuckles. An instrument called the pleximeter is sometimes laid against the part, to strike on. If the surface is soft over the part to be percussed, the left hand is pressed against it firmly, and the middle finger of it struck with the ends of the fingers of the right hand to bring out the sound. This method of examination also requires much practice on the healthy as well as the unhealthy animal.

BRONCHITIS.

As previously described, the windpipe terminates by dividing into the right and left bronchi, running to the right and left lung, respectively. After reaching the lungs these tubes divide into innumerable branches, gradully decreasing in size, which penetrate all parts of the lungs, ultimately terminating in the air-cells. The bronchial tubes are formed much the same as the windpipe, consisting of a base of cartilaginous rings with a layer of fibrous and muscular tissue, and lined internally with a continuation of the respiratory mucous membrane.

Bronchitis is an inflammation of the bronchial tubes. The mucous membrane alone may be affected, or the inflammation may involve the whole tube. Bronchitis affecting the larger tubes is less serious than when the smaller are involved. The disease may be either acute or chronic. The causes are generally much the same as for other diseases of the respiratory organs, noticed in the beginning of this article. The special causes are: The inhalation of irritating gases and smoke, and fluids or solids gaining access to the parts. Bronchitis is occasionally associated with influenza and other specific fevers. It also supervenes on common cold or sore throat.

Symptoms.—The animal appears dull; the appetite is partially or wholly lost; the head hangs; the breathing is very much quickened; the cough, at first dry, and having somewhat the character of a "barking cough," is succeeded in a few days by a moist rattling cough; the mouth is hot; the visible membranes in the nose are red; the pulse is frequent, and during the first stage is hard and quick, but as the disease advances becomes smaller and more frequent. After a few days a whitish discharge from the nostrils ensues; sometimes this discharge

is tinged with blood, and occasionally it may be of a brownish or rusty color. By auscultation or placing the ear to the sides of the chest unnatural sounds can now be heard. The air passing over the inflamed surface causes a hissing or wheezing sound when the small tubes are affected, and a hoarse, cooing, or snoring sound when the larger tubes are involved. After one or two days the dry stage of the disease is succeeded by a moist state of the membrane. The ear now detects a different sound, caused by the bursting of the bubbles as the air passes through the fluid, which is the exudate of inflammation and the augmented mucous secretions of the membrane. The mucus may be secreted in great abundance, which, by blocking up the tubes, may cause a collapse of a large extent of breathing surface. Usually the mucus is expectorated, that is, discharged through the nose. The matter is coughed up, and when it reaches the larynx much of it may be swallowed, or, as the case may be, discharged from the nostrils. The horse can not spit like the human being, nor does the matter coughed up gain access to the mouth. In serious cases all the symptoms become aggravated. The breathing is labored, short, quick, but not painful. It is both thoracic and abdominal. The ribs rise and fall much more than natural. This fact alone is enough to exclude the idea that the animal may be affected with pleurisy, because, in pleurisy, the ribs are as nearly fixed as in the power of the animal to do so, and the breathing accomplished to a great extent by aid of the abdominal muscles. The horse persists in standing throughout the attack. He prefers to stand with head to a door or window to gain all the fresh air possible, but may occasionally wander listlessly about the stall if not tied. The bowels most likely are constipated; the dung is covered with slimy mucus. This appearance of the dung is usually defined by stablemen to be "cold on the bowels," or "dung covered with cold." The urine is decreased in quantity and darker in color than usual. The animal shows more or less thirst; in some cases the mouth is full of saliva. The discharge from the nose increases in quantity as the disease advances and inflammation subsides. This is rather a good symptom, as it shows one stage has passed. The discharge then gradually decreases, the cough becomes less rasping but of more frequent occurrence until it gradually disappears with the return of health.

Bronchitis, affecting the smaller tubes, is one of the most fatal diseases, while that of the larger tubes is never very serious. It must be stated, however, that it is an exceedingly difficult matter for a non-expert to discriminate between the two forms, and further, it may as well be said here that the non-expert will have difficulty in discriminating between bronchitis and pneumonia. Therefore the writer will endeavor to point out a course of treatment in each disease that will positively benefit either affection if the reader happens to be mistaken in his diagnosis. The critic may say that this plan is not a truly scientific method of treating disease. The only reply necessary to be made

is that this series of articles is intended to be of practical value to the horse-owning public, and is in no manner intended as a text-book for experts and those already acquainted with the technical literature on the subject. Scientific terms which would make the work easy for the author would only tend to make it valueless to the general reader. Likewise a different prescription for each form and stage of the affection would only confuse a person who is unable to appreciate the various phases of the disease.

Treatment.—Of first importance is to insure a pure atmosphere to breathe, and next to make the patient's quarters as comfortable as possible. A well-ventilated box-stall serves best for all purposes. Cover the body with a blanket, light or heavy as the season of the year demands. Hand rub the legs until they are warm, then apply flannel or Derby bandages from the hoofs to the knees and hocks. If the legs can not be made warm with hand rubbing alone, apply the liniment recommended in the treatment of sore throat. Rub in thoroughly and then put on the bandages. Also, rub the same liniment well over the side of the chest, behind the elbow and shoulder-blade, covering the space beginning immediately behind the elbow and shoulder-blade and running back about 18 inches, and from the elbow below to within 5 or 6 inches of the ridge of the backbone above. Repeat the application to the side of the chest about 5 days after the first one is applied.

Compel the animal to inhale steam as advised for cold in the head. In each bucketful of boiling water put a tablespoonful of oil of turpentine. This medicated vapor coming in direct contact with the inflamed bronchial tubes is of much greater benefit than can be imagined by one who has not experienced its good effect. In serious cases the steam should be inhaled every hour, and in any case the oftener it is done the greater will be the beneficial results. Three times a day administer the following drench: Solution of the acetate of ammonia, 3 ounces; spirits of nitrous ether, 2 ounces; bicarbonate of potassium, one-half ounce; water, 1 pint. Care must be used in drenching. If it greatly excites the horse it is best not to push it. If you see that it does harm do not persist in making the animal worse. Be satisfied with dissolving one-half ounce of bicarbonate of potassium in every bucketful of water the animal will drink. It is well to keep a bucketful of cold water before the animal all the time. If the horse is prostrated and has no appetite give the following drench: Spirits of nitrous ether, 2 ounces; rectified spirits, 3 ounces; water, 1 pint. Repeat the dose every four or five hours if it appears to benefit. When the horse is hard to drench, and if you have some one about who is expert in administering balls, give the following: Pulverized carbonate of ammonia, 3 drams; linseed meal and molasses sufficient to make the whole into a stiff mass; wrap it with a small piece of tissue paper and it is ready to administer. This ball may be repeated every four or five hours. When giving the ball care should be taken to prevent its breaking in

the mouth, as in case of such accident it will make the mouth sore, which may prevent the animal from eating. If the bowels are constipated give enemas of warm water. Do not give purgative medicines. Do not bleed the animal. Depressing treatment only helps to bring on a fatal termination.

If the animal retains an appetite a soft diet is preferable, such as scalded oats, bran mashes, and grass if in season. If he refuses cooked food allow in small quantities anything he will eat. Hay, corn, oats, bread, apples, carrots may all be tried in turn. Some horses will drink sweet milk when they refuse all other kinds of food, and especially is this the case if the drinking water is withheld for awhile. One or two gallons at a time, four or five times a day, will support life. Bear in mind that when the disease is established it will run its course, which may be from two to three weeks, or even longer. Good nursing and patience are required.

When the symptoms have abated and nothing remains of the disease except the cough and a white discharge from the nostrils, all other medicines should be discontinued and a course of tonic treatment pursued. Give the following mixture: Pulverized sulphate of iron, 3 ounces; powdered gentian, 8 ounces; mix well together and divide into sixteen powders. Give a powder every night and morning mixed with bran and oats, if the animal will eat it, or shaken with about a pint of water and administered as a drench.

If the cough remains for a length of time that leads you to think it will become chronic, say three or four weeks after the horse is apparently well, apply the liniment to the throat and down over the windpipe and over the breast. Rub it in thoroughly once a day until three or four applications are made. Also give 1 dram of iodide of potassium dissolved in a bucketful of drinking water, one hour before each meal for two or three weeks if necessary. Do not put the animal at work too soon after recovery. Allow ample time to regain strength. This disease is prone to become chronic and may run into an incurable case of thick wind.

It has been stated that it will be a difficult matter for the non-professional to discriminate between bronchitis and pneumonia. In fact the two diseases are often associated, constituting broncho-pneumonia; therefore, the reader should carefully study the symptoms and treatment of pneumonia.

CHRONIC BRONCHITIS.

This may be due to the same causes as acute bronchitis, or it may follow the latter disease. An attack of the chronic form is liable to be converted into acute bronchitis by a very slight cause. This chronic affection in most instances is associated with thickening of the walls of the tubes. Its course is slower, it is less severe, and is not accompanied with as much fever as the acute form. If the animal is exerted

the breathing becomes quickened and he soon shows signs of exhaustion. In many instances the animal keeps up strength and appearances moderately well, but in other cases the appetite is lost, flesh gradually disappears, and the horse becomes emaciated and debilitated. It is accompanied by a cough, which in some cases is a husky, smothered, or muffled excuse for a cough, while in other cases the cough is hard and clear. A whitish matter is discharged from the nose, which may be curdled in some instances. If the ear is placed against the chest behind the shoulder blade, the rattle of the air passing through the mucus can be heard within. It is stated that the right side of the heart may become enlarged to such an extent that it is easily felt beating by placing the hand against the chest behind the right elbow.

Treatment.—Generally the horse is kept at work when he is affected with this form of bronchial trouble, as the owner says "he has only a deep cold." It is true that some authorities express the opinion that work does no harm, but they are mistaken. Rest is necessary, if a cure is desired, as even under the most favorable circumstances, a cure is difficult to effect. The animal can not stand exertion, and should not be compelled to undergo it. Besides, there is a great probability of acute bronchitis supervening at any time.

The animal should have much the same general care and medical treatment prescribed for the acute form; if material benefit has not been derived give the following: Powdered nux vomica, 3 ounces; powdered arsenic, 70 grains; powdered sulphate of copper, 3 ounces; mix together and divide into thirty-four powders. Give a powder mixed with bran and oats every night and morning. An application of mustard applied to the breast is a beneficial adjunct. If all other treatment fails, try the following combination, recommended by a good authority: Hydrocyanic acid (Scheele's strength), 20 minims; nitrate of potassium, 3 drams; bicarbonate of soda, 1 ounce; water, 1 pint. This dose should be given every morning and evening for one or two weeks, if necessary.

The diet should be the most nourishing. Bad food is harmful at any time, but especially in this disease. Avoid bulky food. Linseed mashes, scalded oats, grass and green-blade fodder, if in season, is the best diet.

THE LUNGS.

The lungs are the essential organs of respiration. They consist of two (right and left) spongy masses, commonly called the "lights," situated entirely within the thoracic cavity. On account of the space taken up by the heart, the left lung is the smaller. Externally, they are completely covered by the pleura. The structure of the lung consists of a light, soft, but very strong and remarkably elastic tissue, which can only be torn with difficulty. The lung of the fœtus which has never respired will sink if placed in water, but after the

lung has been inflated with air it will float on water so long as healthy. This fact is made useful in deciding whether or not an animal was born dead or died after its birth. Each lung is divided into a certain number of lobes, which are subdivided into numberless lobules (little lobes). A little bronchial tube terminates in every one of these small lobules. The little tube then divides into minute branches which open into the air-cells (pulmonary vesicles) of the lungs. The air-cells are little sacs having a diameter varying from one-seventieth to one-two-hundredth of an inch; they have but one opening, the communication with the branches of the little bronchial tubes. Small blood-vessels ramify in the walls of the air-cells. The walls of the air-cells are extremely thin and consist of two layers; the blood-vessels, being between the layers, thus expose a surface to the air in two different cells. The air-cells are the consummation of the intricate structures forming the respiratory apparatus. They are of prime importance, all the rest being complementary. It is within these cells that is accomplished all that constitutes the ultimate result of the function of respiration. It is here the exchange of gases takes place. As before stated, the walls of the cells are very thin; so, also, are the walls of the blood-vessels. Through these walls escapes from the blood the carbonic-acid gas that has been absorbed by the blood in its circulation through the different parts of the body; and through these walls is absorbed by the blood, from the air in the air-cells, the oxygen gas which is the life-giving element of the atmosphere.

Throughout the substance of the lungs the bronchial tubes terminate in the air-cells. Blood-vessels are in every part; likewise lymphatic vessels and nerves, which require no more than mention in this paper.

To give a rude idea of the arrangement of the respiratory apparatus as a whole, we may profitably compare it to a tree, for the want of a better illustration. Say that all the respiratory tract from the nasal openings back to the pharynx are the roots in the ground; the larynx may be compared to the large part of the trunk just above the earth; the windpipe will represent the body or the bole of the tree; the right and left bronchi may be considered the first two or largest limbs; the bronchial tubes are then comparable to all the rest of the limbs, branches and twigs, gradually becoming smaller and branching out more frequently, until the smallest twigs terminate by having a leaf appended; and to complete the comparison we may as well say the leaf will do to represent the air-cells. Now, imagine all parts in and around the limbs, branches, twigs, and leaves filled in with some material (say cotton or tow) and the whole covered over with silk or satin to about the beginning of the branches on each of the first two large limbs. The cotton or tow represents the lung-tissue and the silk or satin covering will represent the pleura. It must be admitted that this is rather a rough way to handle such delicate structures, but if the reader is possessed of a good imagination he may gain, at least, a com-

prehension of the subject that will suffice for the purpose of being better able to locate the various diseases and appreciate the mechanism of the respiratory organs in their relations to each other.

CONGESTION OF THE LUNGS.

Inflammation of the lungs is always preceded by congestion, or, to make it plainer, congestion may be considered as the first stage of inflammation. Congestion is essentially an excess of blood in the vessels of the parts affected. Congestion of the lungs in the horse, when it exists as an independent affection, is generally caused by overexertion when the animal is not in a fit condition to undergo more than moderate exercise.

The methods practiced by the trainers of running and trotting horses will give an idea of what is termed "putting a horse in condition" to stand severe exertion. The animal at first gets walking exercises, then after some time he is made to go faster and farther each day; the amount of work is daily increased until the horse is said to be "in condition." An animal so prepared runs no risk of being affected with congestion of the lungs if he is otherwise healthy. On the other hand, if the horse is kept in the stable for the purpose of laying on fat or for want of something to do, the muscular system becomes soft, and the horse is not in condition to stand the severe exertion of going fast or far, no matter how healthy he may be in other respects. If such a horse be given a hard ride or drive, he may start off in high spirits, but soon becomes exhausted, and if he is pushed he will slacken his pace, show a desire to stop, and may stagger or even fall. Examination will show the nostrils dilated, the flanks heaving, the countenance haggard, and every other appearance of suffocation. How was this brought about? The heart and muscles were not accustomed to the sudden and severe strain put upon them; the heart became unable to perform its work; the blood accumulated in the vessels of the lungs, which eventually became engorged with the stagnated blood, constituting congestion of the lungs.

The animal, after having undergone severe exertion, may not exhibit any alarming symptoms until returned to the stable; then he will be noticed standing with his head down, legs spread out, the eyes wildly staring or dull and sunken. The breathing is very rapid and almost gasping, the body is covered with perspiration in most cases, which, however, may soon evaporate, leaving the surface of the body and the legs and ears cold; the breathing is both abdominal and thoracic; the chest rises and falls and the flanks are powerfully brought into action. If the pulse can be felt at all it will be found beating very frequently, one hundred or more to a minute. The heart may be felt tumultuously thumping if the hand is placed against the chest behind the left elbow, or it may be scarcely perceptible. The animal may tremble all over the body. If the ear is placed against the side of the chest a loud murmur will be heard, and perhaps a fine crackling sound.

No intelligent person should fail to recognize a case of congestion of the lungs when brought on by overexertion, as the history of the case is sufficient to point out the ailment. The disease may also arise from want of sufficient pure air in stables that are badly ventilated. In all cases of suffocation the lungs are congested. It is also seen in connection with other diseases.

Treatment.—If the animal is attacked by the disease while on the road stop him immediately. Do not attempt to return to the stables. If he is in the stable make arrangements at once to insure an unlimited supply of pure air. If the weather is warm, out in the open air is the best place, but if too cold let him stand with head to the door. By no means have him walked, as is sometimes done. Let him stand still; he has all he can do if he obtains sufficient pure air to sustain life. If he is encumbered with harness or saddle remove it at once and begin rubbing the body with cloths or wisps of hay or straw. This stimulates the circulation in the skin, and thus aids in relieving the lungs of the extra quantity of blood that is stagnated there. If you have three or four assistants let them go to work with enthusiasm, rub the body and legs well, until the skin feels natural; rub the legs until they are warm, if possible; rub in over the cold part of the legs an application of the liniment recommended for the same purpose in the treatment of bronchitis, but do not apply it to the chest. When the circulation is re-established, put bandages on the legs from the hoofs up as far as possible. Throw a blanket over the body and let the rubbing be done under the blanket. Diffusible stimulants are the medicines indicated. Brandy, whisky (or even ale or beer if nothing else is at hand), ether, and tincture of arnica are all useful. Two ounces each of spirits of nitrous ether and alcohol, given as a drench, diluted with a pint of water, every hour until relief is afforded, is among the best of remedies. But if it takes too long to obtain this mixture, give a quarter of a pint of whisky in a pint of water every hour, or the same quantity of brandy as often, or a quart of ale every hour, or an ounce of tincture of arnica in a pint of water every hour until five or six doses have been given. If none of these remedies are at hand, 2 ounces of oil of turpentine, shaken with a half pint of milk, may be given. This will have a beneficial effect until more applicable remedies are obtained. A tablespoonful of aqua ammonia (hartshorn), diluted with a pint of water and given as a drench every hour, has undoubtedly been of great service in saving life when nothing else could be obtained in time to be used with benefit. If the foregoing treatment fails to be followed by a marked improvement after seven or eight hours' perseverance, the animal may be bled from the jugular vein. Do not take more than 5 or 6 quarts from the vein, and do not repeat the bleeding. The blood thus drawn will have a tarry appearance.

When the alarming symptoms have subsided active measures may be stopped, but care must be used in the general treatment of the ani-

mal for several days, for it must be remembered that congestion may be followed by pneumonia. The animal should have a comfortable stall, where he will not be subjected to draughts or sudden changes of temperature; he should be blanketed and the legs kept bandaged. The air should be pure, a plentiful supply of fresh cold water always before him, and a diet composed principally of bran mashes, scalded oats, and grass, if in season. When ready for use again he should at first receive moderate exercise only, which may be daily increased until he may safely be put at regular work.

APOPLEXY OF THE LUNGS.

This is but another term for congestion of the lungs, and for practical purposes needs no special description, except to remark that when a hemorrhage occurs during the congested state of the lungs the blood escapes from the ruptured vessels and extravasates into the lung tissue. Such cases are called pulmonary apoplexy, and usually occur during the course of some specific disease.

PNEUMONIA—LUNG FEVER.

Pneumonia may attack both lungs, but as a general rule one lung only is affected, and in the great majority of cases it is the right lung. The air-cells are the parts affected principally, but the minute branches of the bronchial tubes always, to a greater or less extent, are involved in the inflammation. Inflammation of the lungs occurs in three principal varieties, but in a work of this kind there is no necessity to discriminate, and therefore the disease will be described under a common head. It already has been mentioned that pneumonia may be complicated with bronchitis, and it will hereafter be pointed out that it is very commonly complicated with pleurisy. In this article the disease will be considered mainly as an independent affection, and its complications will be more fully described under separate heads.

The inflammation usually begins in the lower part of the lung and extends upwards. The first stage of the disease consists of congestion or engorgement of the blood-vessels, and if this condition continues the blood exudes from the vessels into the adjacent lung tissue; if rupture of small blood-vessels occurs there will be extravasations of blood in the contiguous parts. The fluids thus escaping collect in the air-cells and in the minute branches of the little bronchial tubes, and, becoming coagulated there, completely block up the cells and exclude the air.

In this condition the lung is increased in volume and is much heavier, and will sink in water. The pleura covering the affected parts is always more or less inflamed. A continuance of the foregoing phenomena is marked by a further escape of the constituents of the blood, and a change in the membrane of the cells, which become swollen. The exudate that fills the air-cells and minute bronchial branches undergoes disintegration, and is converted into a fatty material. The walls of the cells almost invariably remain unaltered.

It must not be imagined that the foregoing changes take place in

a uniform manner. While one portion is only congested another part may be undergoing disintegration, while still another part may be involved in the exudative stage.

The usual termination of pneumonia is in resolution, that is, a restoration to health. This is gradually brought about by the exuded material contained in the air-cells and lung tissues becoming degenerated into fatty and a mucus-like substance which are removed by absorption. The blood-vessels return to their natural state and the blood circulates in them as before. Much material, the result of the inflammatory process, is also gotten rid of by expectoration, or rather (in the horse) by discharge from the nostrils. In the cases that do not terminate so happily the lung may become gangrenous (or mortified), or an abscess may form, or the disease may be merged into the chronic variety.

Pneumonia may be directly induced by any of the influences named as general causes for diseases of the organs of respiration, but in many instances it is due to either willful neglect or ignorance. A common cold or sore throat may run into a fatal case of pneumonia if neglected or improperly treated. An animal may be debilitated by a cold, and when in this weakened state may be compelled to undergo exertion beyond his strength; or he may be kept in bad quarters, such as a badly ventilated stable, where the foul gases are shut in and the pure air is shut out; or the stable may be so open that parts of the body are exposed to draughts of cold air. Either of the foregoing causes may induce congestion of the lungs in an animal predisposed to it on account of having already a disease of the respiratory organs. The congestion is soon followed by the other stages of inflammation, and a case of pneumonia is established with a tendency to a fatal termination, as it is altogether likely the animal will be so much reduced in constitution as to be unable to fight off a collapse. An animal is predisposed to pneumonia when debilitated by any constitutional disease, and especially during convalescence if exposed to any of the exciting causes. Foreign bodies, such as food, accidentally getting in the lungs by way of the windpipe, as well as the inhalation of irritating gases and smoke, ofttimes produce fatal attacks of inflammation of the lung and bronchial tubes. Pneumonia is frequently seen in connection with other diseases, such as influenza, purpura hemorrhagica, strangles, glanders, etc. An abnormal state of the blood predisposes to it. Pneumonia and pleurisy are most common during cold, damp weather, and especially during the prevalence of the cold north and northeasterly winds. Wounds puncturing the thoracic cavity may induce it.

Symptoms.—Pneumonia, when a primary disease, is ushered in by a chill, more or less prolonged, which in most cases is seen neither by the owner nor the attendant, but is overlooked. The breathing becomes accelerated, and the animal hangs its head and has a very dull appearance. The mouth is hot and has a sticky feeling to the touch; the heat conveyed to the finger in the mouth demonstrates a fever; if the ther-

mometer is placed in the rectum the temperature will be found to have risen to 103° F., or higher. The pulse is very frequent, beating from seventy or eighty to one hundred or more a minute; the character of the pulse varies very much; it may be hard or feeble, large or small, intermitting, etc. There is usually a dry cough from the beginning, which, however, changes in character as the disease advances; for instance it may become moist, or if pleurisy sets in the cough will be peculiar to the latter affection, that is, cut short in the endeavor to suppress it. In some cases the discharge from the nostrils is tinged with blood, while in other cases it has the appearance of matter. The appetite is lost to a greater or less extent, but the desire for water is increased, particularly during the onset of the fever. The membrane within the nostrils is red and at first dry, but sooner or later becomes moist. The legs are cold. The bowels are more or less constipated, and what dung is passed is usually covered with a slimy mucus. The urine is passed in smaller quantities than usual and is of a darker color.

The animal prefers to have the head where the freshest air can be obtained. When affected with pneumonia a horse does not lie down, but persists in standing from the beginning of the attack. However, if pneumonia is complicated with pleurisy the horse may appear restless and lie down for a few moments to gain relief from the pleuritic pains, but he soon rises. In pneumonia the breathing is very rapid, and sometimes even the most negligent observer will notice that it is difficult, but when the pneumonia is complicated with pleurisy the ribs are kept as still as possible and the breathing is abdominal, that is, the abdominal muscles are now made to do as much of the work as they can perform. Remember if pleurisy is not present there is no pain. To the ordinary observer the animal may not appear dangerously ill, as he does not show the seriousness of the ailment by violence, as in colic, but a careful observer will discover at a glance that the trouble is something more serious than a cold.

If the reader has practiced auscultation and percussion sufficiently to discriminate the sounds, or absence of sounds, of the diseased lung from the sounds of the normal lung, he may still further satisfy himself in diagnosing the ailment. When the lung is healthy, if the chest is knocked on, a more or less resonant sound is emitted, according to the part struck; but when the air cells are filled with the exudate of inflammation, and the surrounding lung tissue contains the exudate and extravasated blood, the air is excluded, and the part of the lung thus affected is solidified; now, if the chest is struck over this solidified part, a dull sound is obtained. Therefore, percussion not only shows that the lung is affected with pneumonia, but it points to the spot affected. Moreover, if pleurisy exists in conjunction with pneumonia, and the walls of the chest are knocked on with a view of gaining information from the sounds elicited, when that part immediately over the affected pleura is struck, the animal flinches, as the blows, even if they are but moderate, cause severe pain.

By auscultation, listening to the sounds within the chest, we gain much information. When the ear is placed against the chest of a healthy horse the respiratory murmur is heard more or less distinctly, according to the part of the chest that is beneath the ear. In the very first stage of pneumonia this murmur is louder and hoarser; and, also, there is heard a fine crackling sound something similar to that produced when salt is thrown in a fire. After the affected part becomes solid there is an absence of sound over that particular part. After absorption begins, you will again hear sounds, which gradually change until the natural sound is heard announcing the return of health.

When a fatal termination is approaching all the symptoms become intensified. The breathing becomes still more rapid and difficult; the flanks heave; the poor animal stares wildly about as if imploring aid to drive off the terrible feeling of suffocation; the body is bathed with the sweat of death; he staggers, but quickly recovers his balance; he may now, for the first time during the attack, lie down; he does so, however, in the hope of relief, which he fails to find, and with difficulty struggles to his feet; he pants; he heaves; the nostrils flap; he staggers and sways from side to side and backwards and forwards, but still tries to retain the standing position, even by propping himself against the stall. It is no use, as after a fearful and agonizing fight for breath, he goes down; still instinct with the desire to live he makes a few ineffectual efforts to breathe, which only result in a horrible wheezing, gasping noise; the limbs stretch out and become rigid, and—he rises no more. A bystander breaks the silence with the remark, "He died hard." Such is the usual death scene when caused by pneumonia. It amounts to a veritable struggle against suffocation. Death ensues usually in from ten to twenty days after the beginning of the attack. On the other hand when the disease is terminating favorably the signs are obvious. When the fever abates the animal gradually improves in appetite; he takes more notice of things around him; his spirits improve; he has a general appearance of returning health, and he lies down and rests easy. In the great majority of cases pneumonia, if properly treated, is by no means a fatal disease.

Treatment.—The general outline of the treatment is much the same as advised for bronchitis. The comfort and surroundings of the patient must be attended to first. The quarters should be the best that can be provided. Pure air is essential. Avoid placing the animal in a stall where he may be exposed to draughts of cold air and sudden changes of temperature. Some authorities state that such exposure is not harmful after pneumonia has set in, but nevertheless the reader is advised to pursue the conservative course and not to experiment. When making the stable comfortably warm do not prevent the access of pure air. It is much better for the animal if the air is cold and pure than if it is warm and foul. It is better to make the animal comfortable with warm clothing than to make the stable warm by shutting off the ventilation. The animal should have an unlimited supply of fresh cold

drinking water from the start. Blanket the body. Rub the legs until they are warm and then put bandages on them from the hoofs up as far as they are cold. If warmth can not be re-established in the legs by hand-rubbing alone, apply the liniment as recommended in the treatment of bronchitis.

The bandages should be removed once or twice every day, the legs well rubbed, and the bandages re-applied. Rub well over the affected side an application of the liniment mentioned in the treatment of sore throat. The application may be repeated in four or five days. Do not use mustard; no doubt about its acting, and acting quickly, too, but experience teaches that it is not so good as something less irritating and more prolonged in its beneficial effects. Much harm is often done by clipping off hair and rubbing in powerful escharotic blistering compounds. They do positive injury and retard recovery, and should not be allowed. Much benefit may be derived from hot applications to the sides of the chest if the facilities are at hand to apply them. If the weather be not too cold, and if the animal is in a comfortable stable, the following method may be tried: Have a tub of hot water handy to the stable door; soak a woolen blanket in the water, then quickly wring as much water as possible out of it and wrap it around the chest. See that it fits closely to the skin; do not allow it to sag down so that air may get between it and the skin. Now wrap a dry blanket over the wet hot one. The hot blanket should be renewed every half hour, and while it is off being wetted and wrung, the dry one should remain over the wet part of the chest to prevent reaction. The hot applications should be kept up for three or four hours, and when stopped, the skin should be quickly rubbed as dry as possible, an application of liniment rubbed over the wet part, and a dry blanket snugly fitted over the animal; and especial care should be taken to cover with it the wet part of the skin. If the hot applications appear to benefit, they may be tried on three or four consecutive days. Unless every facility and circumstance favors the application of heat in the foregoing manner do not attempt it. If the weather is very cold, or any of the details are omitted, more harm than good may result. In the majority of cases, warm clothing to the body, bandages to the legs, and the liniment applied to legs and chest will suffice.

It is possible that cases occur that may be slightly benefited by bleeding, but the non-expert is certainly unable to discriminate in such instances, and therefore blood-letting should never be practiced. Indeed, many veterinary practitioners of great experience wholly condemn the practice of bleeding in pneumonia, as positively hurtful. When pneumonia follows another disease the system is always more or less debilitated, and requires the careful use of stimulants from the beginning; to still further weaken the animal by tapping him (if the expression may be used), and letting escape in a stream the very source of his remaining strength, is one of the most effectual methods of retarding recovery, even if it does not hasten a fatal termination.

Another and oftentimes a fatal mistake made by the non-professional is the indiscriminate and reckless use of aconite. This drug is one of the most active poisons, and should not be handled by any one who does not thoroughly understand its action and uses. It is only less active than prussic acid in its poisonous effects. It is a common opinion, often expressed by non-professionals, that aconite is a stimulant; nothing could be more erroneous. In fact, it is just the reverse; it is one of the most powerful sedatives used in the practice of medicine. In fatal doses it kills by paralyzing the very muscles used in breathing; it weakens the action of the heart, and should not be used in any but strong or sthenic types of inflammation, and then only by the expert. After an extensive experience in the treatment of pneumonia in various sections, from the cold northern regions of Canada to the temperate climate of Virginia and North Carolina, the writer has discarded aconite entirely from the list of medicines he uses in the treatment of this affection. Do not give purgative medicines. If constipation exists, overcome it by an allowance of laxative diet, such as scalded oats, bran and linseed mashes, and grass if in season.

A careful observer will notice that the dung passed by the animal is coated with mucus; this is an indication that the bowels are in an irritable condition; in fact they are affected to a small extent by the disease. Now, if a purgative dose is administered the irritable state is aggravated; they become inordinately active and a diarrhea or superpurgation is established that proves a most difficult matter to check. It must be remembered that the animal is already weakened by an exhaustive disease, and the "running off at the bowels" not only still further weakens the animal, but may cause the bowels to become inflamed, and thus insure a fatal termination. It is a common practice among non-professionals to give aloes and oil to a horse with pneumonia, and, considering this fact, it is no wonder that it proves such a fatal disease in their hands. If the costiveness is not relieved by the laxative diet, give an enema of about a quart of warm water three or four times a day.

A diet consisting principally of bran mashes, scalded oats, grass or blade fodder, when in season, is preferable if the animal retains an appetite; but if no desire is evinced for food of this particular description, then the animal must be allowed to eat anything that will be taken spontaneously. Hay tea, made by pouring boiling water over good hay in a large bucket, and allowing it to stand until cool, then straining off the liquid, will sometimes create a desire for food. The animal may be allowed to drink as much of it as he desires. Corn on the cob is often eaten when everything else is refused. Bread may be tried, also apples or carrots. If the animal can be persuaded to drink milk it may be supported by it for days. Three or four gallons of sweet milk may be given during the day, in which may be stirred three or four fresh eggs to each gallon of milk. Some horses will drink milk, while others will refuse to touch it. It should be borne in mind that

all food must be taken by the horse as he desires it. No food should be forced down him. If the animal will not eat, you will only have to wait until a desire is shown for food. All kinds may be offered, first one thing and then another, but food should not be allowed to remain long in trough or manger; the very fact of it constantly being before him will cause him to loathe it. When the animal has no appetite for anything, the stomach is not in a proper state to digest food, and if it is poured or drenched into him it will only cause indigestion and aggravate the case. It is a good practice to do nothing when there is nothing to be done that will benefit. This refers to medicine as well as food. Nothing is well done that is over done. The following drench should be administered every six hours: Solution of the acetate of ammonia, 3 ounces; spirits of nitrous ether, 1 ounce; bicarbonate of potassium, 3 drams; water, 1 pint. Care should be used in drenching; no recklessness such as filling the mouth with medicines, then holding the hand tightly over the nostrils and pounding on the throat and windpipe, kicking the horse in the belly or ribs, or other like conduct, should be practiced. If the animal coughs or attempts to cough while the head is up, let the head down immediately. Better to lose the medicine than to cause it to get into the lungs.

There are many valuable medicines used for the different stages and different types of pneumonia, but in the opinion of the writer it is useless to refer to them here, as this work is intended for the use of those who are not sufficiently acquainted with the disease to recognize its various types and stages; therefore they would only confuse. If you can administer a ball or capsule, or have any one at hand who is capable of doing it, a dram of sulphate of quinine in a capsule, or made into a ball, with sufficient linseed meal and molasses, given every three hours during the height of the fever, will do good in many cases. The ball of carbonate of ammonia, as advised in the treatment of bronchitis, may be tried if the animal is hard to drench.

If the horse becomes very much debilitated, stimulants of a more pronounced character are required. The following drench is useful: Rectified spirits, 3 ounces; spirits of nitrous ether, 2 ounces; water, 1 pint. This may be repeated every four or five hours if it seems to benefit. Or 6 ounces of good whisky, diluted with a pint of water, may be given as often, instead of the foregoing.

There are cases where sedatives are undoubtedly beneficial, but a knowledge both of disease and medicine is required to discriminate in such cases; therefore the only rational course to pursue in a work of this kind is to map out a line of treatment that will do good in all cases and harm in none, and at the same time be within the understanding of those who have not made a special study of disease.

During the period of convalescence good nutritive food should be allowed in a moderate quantity. Tonic medicines should be substituted for those used during the fever. The same medicines advised for the

convalescing period of bronchitis are equally efficient in this case. Likewise, the same general instructions apply here.

Death may occur during the first stage of the disease, owing to the severity of the fever, or it may occur during the period when the lungs are solidified by the exudate of the inflammation filling up the air cells and bronchial tubes, or it may take place later, when the exudate fails to liquify and undergo absorption, and is then due to suppuration, the formation of an abscess, or gangrene or mortification. As a matter of course pneumonia is most often fatal when both lungs are involved in the inflammation.

In concluding, it may be well to remind you that if pneumonia is properly treated the great majority of cases will terminate in a complete restoration to health. In all cases much will depend on the good judgment of the person directing the treatment of the case. If it is seen that any one thing is doing harm, then that particular thing should be omitted. For instance, if drenching the animal is attended with harm, that is, if it unnecessarily excites him, or if he obstinately refuses to swallow the medicine, then do not further annoy him by persistently trying to do what you are able to see only makes matters worse. Omit the drenching, and dissolve 3 drams of bicarbonate of potassium in every bucketful of water he will drink of his own free will. Give the quinine in capsules or balls, and also the carbonate of ammonia balls. A balling iron (or mouth speculum) may be obtained from any veterinary instrument dealer. A little practice with it will enable you to become somewhat expert in giving medicines in the latter form. Do not give quinine and ammonia together; let at least an hour intervene between the administration of the two different medicines.

PLEURISY.

The thoracic cavity is divided into two lateral compartments, each containing one lung, besides other organs. Each lung has its separate pleural membrane or covering. The anatomical arrangement of the pleura is simple to the anatomist, but a detailed description of it would be beyond the comprehension of the average reader. Suffice it to say that the pleura is the thin, glistening membrane that covers the lung, and also completely covers the internal walls of the chest. It is very thin, and to the ordinary observer appears to be part of the lung, which, in fact, it is for all practical purposes. The smooth, shiny surface of the lung, as well as the smooth, shiny surface so familiar on the rib, is the pleura. In health this surface is always moist. A fluid (called serum) is thrown off (secreted) by the pleura, which causes the surface to be constantly moist. This is to prevent the effects of friction between the lungs and the walls of the chest and other contiguous parts which come in contact. It must be remembered the lungs are constantly dilating each time a breath is taken in, and contracting each time a breath of air is expelled. It may be readily seen that if it were not for the moistened state of the surface of the pleura the continual dilation

and contraction and the consequent rubbing of the parts against each other would cause a serious friction. This, then, is the office of the pleura—to secrete or moisten its surface with a fluid to prevent the ill effects of friction.

Inflammation of this membrane is called pleurisy. Being so closely united with the lung, it can not always escape participation in the disease when the latter is inflamed. Pleurisy may be due to the same predisposing and exciting causes as mentioned in the beginning of this work as general causes for diseases of the organs of respiration, such as exposure to sudden changes of temperature, confinement in damp stables, etc. It may be caused by wounds that penetrate the chest, for it must be remembered that such wounds must necessarily pierce the pleura. A fractured rib may involve the pleura. The inflammation following such wounds may be circumscribed, that is, confined to a small area surrounding the wound, or it may spread from the wound and involve a large portion of the pleura. The pleura may be involved secondarily when the heart or its membrane is the primary seat of the disease. It may occur in conjunction with bronchitis, influenza, and other diseases. It is commonly seen in connection with rheumatism. Diseased growths that interfere with the pleura may induce pleurisy, but it is most frequently met with in connection with pneumonia, for the reason given heretofore. Pleurisy will be described here as an independent affection, although it should be remembered that it is very often associated with the foregoing diseases.

When the animal is affected with pleurisy an ordinary observer should have no difficulty in detecting the disease, provided the diagnostic symptoms are studied beforehand. The very first stage is a congested state of the blood vessels in the parts affected; the surface of the membrane becomes dry and roughened (this fact will be again referred to when the symptoms are described). This dry condition is followed, after a certain period, by an effusion of fluid, that is, more fluid than usual is thrown off by the membrane when in a diseased condition. This fluid accumulates in the space between the lungs and the walls of the chest, constituting hydro-thorax, or dropsy of the chest. This fluid may undergo certain changes; in it float coagulated masses called fibrin. The surface of the lung may adhere to the internal surface of the ribs. The quantity of exuded fluid varies to a great extent. In some cases the chest contains an enormous amount, and when it is not absorbed pus may be generated to a greater or less extent.

Symptoms.—When the disease exists as an independent affection it is ushered in by a chill, but this is usually overlooked. About the first thing noticed is the disinclination of the animal to move or turn round. When made to do so he grunts or groans with pain. He stands stiff; the ribs are fixed, that is, the ribs move very little in the act of breathing, but the abdomen works more than natural; both the fore feet and elbows may be turned out; during the onset of the attack the animal may be restless, and act as if he had a slight colic; he may even lie

down, but does not remain long down, for when he finds no relief he soon gets up. After effusion begins these signs of restlessness disappear. If the observer looks for it, a furrow will be found running along the lower part of the chest from behind the elbow back to the flank; this is due to the endeavor of the animal to keep the ribs fixed in as near as possible an immovable position. Every movement of the chest causes excruciating pain, therefore the cough is peculiar; it is short and suppressed, and comes as near being no cough as the animal can make it in his desire to suppress it. The breathing is hurried, the mouth is hot, the temperature being elevated from 102° or 103° to 105° F. The usual symptoms that accompany fever are present, such as costiveness, scanty, dark-colored urine, etc. The pulse is frequent, perhaps seventy or more a minute, and is hard and wiry. The legs and ears are cold.

Percussion is of valuable service in this affection. The ribs may be struck with the knuckles. By striking different parts you will come to a spot of greater or less extent where the blows cause much pain to be evinced. The animal may grunt or groan every time it is struck. Another method of detecting the affected part is to press the fingers between the ribs, each space in succession, beginning behind the elbow, until you arrive at a place where the pressure causes more flinching than at any other part. Auscultation is also useful. In the first stage, when the surfaces are dry and rough, if the ear is placed against different parts of the chest you will eventually come to the affected part, which will be readily manifested by a friction sound very much like that produced by rubbing two pieces of coarse paper together. The sound appears immediately under the ear, and is distinct. No such friction sound occurs when the membrane is healthy, as the natural moisture, heretofore mentioned, prevents the friction. In many cases this friction is so pronounced that it may be felt by placing the hand over the affected part. When the dry stage is succeeded by the exudation of fluid, this friction sound disappears. After the effusion into the cavity takes place there sometimes is heard a tinkling or metallic sound, due to dropping of the exudate from above into the collected fluid in the bottom of the cavity, as the collected fluid more or less separates the lung from the chest walls.

Within two or three days the urgent symptoms are abated, owing to the exudation of the fluid and the subsidence of the pain. The fluid may now undergo absorption, and the case terminate favorably within a week or ten days.

If the quantity of the effusion is large, its own volume retards the process of absorption to a great extent, and consequently convalescence is delayed. In some cases the symptoms manifest a serious state. The pulse becomes more frequent, the breathing more hurried and labored, the flanks work like bellows, the nostrils flap, the eyes stare wildly, the countenance expresses much anxiety, and general signs of dissolution are plain. After a time swellings appear under the chest and abdomen and down the legs. These swellings are due to trans-

fusion of the fluid from within the chest into the surrounding tissues. The accumulation in the chest is called hydro-thorax or dropsy of the chest. When this fluid contains pus the case usually proves fatal. The condition of pus within the cavity is called empyæma.

Pleurisy may affect only a small area of one side, or it may affect both sides. It is oftener confined to the right side.

Treatment.—This varies very little from the treatment of bronchitis and pneumonia, but as frequently stated heretofore, pleurisy is so liable to be complicated with either of the diseases named, the variation in the treatment may be considered as merely adjunct treatment of the pleuritic complication.

The instructions in regard to the general management of bronchitis and pneumonia must be adhered to in the treatment of pleurisy. Comfortable quarters, pure air, warm clothing to the body and bandages to the legs, a plentiful supply of pure cold water, the laxative food, etc., in this case are equally necessary and efficacious. The hot applications applied to the chest as directed in the treatment of pneumonia are very beneficial in pleurisy, and should be kept up while the symptoms show the animal to be in pain.

During the first few days, when pain is manifested by restlessness, do not apply the liniment to the sides of the chest, as it will not only irritate the animal and increase the restlessness but will heighten the fever as well. After four or five days, when the symptoms show that the acute stage has somewhat subsided, the liniment may be well rubbed over the affected part with benefit, as it will greatly promote the absorption of the effusion. The application may be repeated on alternate days until several applications have been made. From the beginning the following drench should be given every six hours: Solution of the acetate of ammonia, 3 ounces; spirits of nitrous ether, 1 ounce; bicarbonate of potassium, 3 drams; water, 1 pint.

If the patient becomes debilitated the stimulants as prescribed for pneumonia should be used according to the same directions. The same attention should be given to the diet. If the animal will partake of the bran mashes, scalded oats, and grass, it is the best, but if he refuses the laxative diet then he should be tried with different kinds of food, and allowed whichever kind he desires.

In the beginning of the attack, if the pain is severe, causing the animal to lie down or paw, the following drench should be given: Tincture of opium, 2 ounces; raw linseed oil, 12 ounces. If the pain continues, the tincture of opium may be repeated within four or five hours.

If the case is not progressing favorably in ten or twelve days after the beginning of the attack, convalescence is delayed by the fluid in the chest failing to be absorbed. The animal becomes dull and weak, and evinces little or no desire for food. The breathing becomes still more rapid and difficult. An effort must now be made to excite the absorption of the effusion. An application of the liniment should be rubbed over the lower part of both sides and the bottom of the chest. The

following drench should be given three times a day, for seven or eight days if it is necessary and appears to benefit: Tincture of the perchloride of iron, 1 ounce; tincture of gentian, 2 ounces; water, 1 pint. Also give 1 dram of iodide of potassium dissolved in the drinking-water an hour before feeding, every night and morning for a week or two.

Hydro-thorax is sometimes difficult to overcome by means of the use of medicines alone, when an operation called *paracentesis thoracis* is performed. In plain language this means tapping the chest to allow an escape for the accumulated fluid. The operation is performed with a combined instrument called the trocar and canula. The puncture is made in the lower part of the chest, in the space between the eighth and ninth ribs. Wounding of the intercostal artery is avoided by inserting the instrument as near as possible to the anterior edge of the rib. If the operation is of benefit it is only so when performed before the strength is lowered beyond recovery. The operation merely receives a passing notice here, as it is not presumed that the non-professional will attempt it, although it is attended with little danger or difficulty in the hands of the expert.

We have described bronchitis, pneumonia, and pleurisy mainly as they occur as independent diseases, and have treated them in a way that an intelligent person can not possibly do harm. While it is true much more might have been said in regard to the different stages and types of the affections, and also in regard to the treatment of each stage and each particular type, the plan adopted is considered the wisest on account of simplifying as much as possible a subject of which the reader is supposed to know very little, if anything.

A few words will now be devoted to these affections as they occur, when two or more exist at the same time and in the same animal.

PLEURO-PNEUMONIA.

The disease is so called when the animal is affected with pleurisy and pneumonia combined, which is most frequently the case. At the beginning of the attack only one of the affections may be present, but the other soon follows. It has already been stated that the pleura is closely adherent to the lung. The pleura on this account is frequently more or less affected by the spreading of the inflammation from the lung tissue. There is a combination of the symptoms of both diseases, but to the ordinary observer the symptoms of pleurisy are the most obvious. The course of treatment to be pursued differs in no manner from that given for the affections when they occur independently. The symptoms will be your guide as to the advisability of giving oil and laudanum for the pain if the pleurisy is very severe. Do not resort to it unless it is necessary to allay the pain.

BRONCHO-PLEURO-PNEUMONIA.

This is the term or terms applied when bronchitis, pleurisy, and pneumonia all exist at once. This is by no means a common occurrence.

However, it is impossible for one who is not an expert to diagnose the state with certainty. The apparent symptoms are the same as when the animal is affected with pleuro-pneumonia.

BRONCHO-PNEUMONIA.

This is also a common complication. Either one or the other may be first in operation. When bronchitis affects the smaller bronchial tubes the inflammation readily extends to the air-cells and thence to the lung tissue, constituting pneumonia. Or the bronchial tube may be secondarily involved by the extension of the inflammation from the air-cells. Nothing in regard to the treatment of this condition requires to be said here, as it has been fully described when speaking of bronchitis and pneumonia as separate diseases. A brief review of some of the unfavorable results of pleurisy and pneumonia will not be out of place here:

SUPPURATION AND ABSCESS IN THE LUNG.

There are instances, and especially when the surroundings of the patient have been bad, when the inflammation terminates in an abscess in the lung. Sometimes, when the inflammation has been extreme, suppuration in a large portion of the lung takes place. Impure air, the result of improper ventilation, is the most frequent cause of this termination. The symptoms of suppuration in the lung are an exceedingly offensive smell of the breath, and the discharge of the matter from the nostrils.

MORTIFICATION.

Gangrene or mortification means a death of the part affected. Occasionally, owing to the intensity of the inflammation or bad treatment, pneumonia and pleuro-pneumonia terminate in mortification, which is soon followed by the death of the animal.

ABSCESS IN THE SPACES BETWEEN THE RIBS.

Abscess of the intercostal spaces has been recorded as a result of pleurisy. Following the attack of pleurisy an enlargement appears on some part of the chest, which may burst of its own accord. When it makes its appearance it is advisable to apply poultices of linseed meal and hot water, or bathe it continuously for hours at a time with water as hot as can be comfortably borne. This treatment will hasten the formation of matter. When it is soft in the center it should be lanced and the matter allowed to escape. The course of tonic treatment and nutritive food advised in the treatment of pleurisy should be kept up.

HÆMOPTYSIS—BLEEDING FROM THE LUNGS.

Bleeding from the lungs may occur during the course of congestion of the lungs, bronchitis, pneumonia, influenza, purpura hemorrhagica, or glanders. An accident or exertion may cause a rupture of a vessel. Plethora predisposes to it. Following the rupture of a vessel the blood may escape into the lung tissue and cause a serious attack of pneumonia, or it may fill up the bronchial tubes and prove fatal by suffocat-

ing the animal. When the hemorrhage is from the lungs it is accompanied by coughing; the blood is frothy and comes from both nostrils. Whereas when the bleeding is merely from a rupture of a vessel in some part of the head (heretofore described as bleeding from the nose) the blood is most likely to issue from one nostril only, and the discharge is not accompanied by coughing. The ear may be placed against the windpipe along its course, and if the blood is from the lungs a gurgling or rattling sound will be heard. When it occurs in connection with another disease it seldom requires special treatment. When caused by accident or overexertion the animal should be kept quiet. If the cough is frequent or paroxysmal a dose composed of 2 ounces of tincture of opium in 8 ounces of raw linseed oil may be given to allay the irritability, which may stop the hemorrhage by checking the cough. If the hemorrhage is profuse and continues for several hours 1 dram of the acetate of lead dissolved in a pint of water may be given as a drench, or 1 ounce of the tincture of the perchloride of iron, diluted with a pint of water, may be given instead of the lead. It is rare that the hemorrhage is so profuse as to require internal remedies. But hemorrhage into the lung may occur and cause death by suffocation without the least manifestation of it by the discharge of blood from the nose.

CONSUMPTION.

Pulmonary consumption, "the same as phthisis or consumption in man," has been described by European authors as affecting the horse. It is mentioned here merely to give the writer an opportunity to say that he never saw a case of it, and never conversed with a veterinarian on the subject who has met with a case in the horse. This fact does not prove that the horse is exempt from the disease, but it at least proves that it must be rare indeed.

DROPSY OF THE LUNG.

This condition has been noticed as a result of heart disease, and as it is said, almost invariably to terminate fatally, no further notice of it is necessary here.

HEAVES—BROKEN WIND—ASTHMA.

Much confusion exists in the popular mind in regard to the nature of broken wind. Many horsemen apply the term to all ailments where the breathing is difficult or noisy. Scientific veterinarians are well acquainted with the phenomena and locality of the affection, but there is a great diversity of opinion as regards the exact cause. Asthma is generally thought to be due to spasm of the small circular muscles that surround the bronchial tubes. The continued existence of this affection of the muscles leads to a paralysis of them, and is considered one of the primary stages of broken wind.

Some eminent veterinarians maintain that the exciting cause of broken wind is due to a lesion of the pneumogastric nerve. That there is good foundation for this opinion there can be no doubt. The pneumogastric

nerves send branches to the bronchial tubes, lungs, heart, stomach, etc. All the organs just mentioned may sooner or later become involved in connection with broken wind. It may be said that broken wind is always associated with disorder of the function of digestion. It is claimed that coarse or indigestible food irritates the brauches of the pneumogastric nerves which supply the walls of the stomach, and this irritation is reflected or extended to the branches of the same nerve which supply the lungs, when the lesions constituting broken wind follow.

In itself broken wind is not a fatal disease, but death is generally caused by an affection closely connected with it. After death, if the organs are examined, the lesions found depend much upon the length of time broken wind has affected the animal. In recent cases very few changes are noticeable, but in animals that have been broken-winded for a long time the changes are well marked. The lungs are paler than natural, and of much less weight in proportion to the volume, as evidenced by floating them in water. The walls of the small bronchial tubes and the membrane of the larger tubes are thickened. The right side of the heart is enlarged and its cavities dilated. The stomach is enlarged and its walls stretched. And in many old cases the intestinal walls undergo the same changes. The important change found in the lungs is a condition technically called pulmonary emphysema. This is of two varieties: First, what is termed vesicular emphysema, which consists of an enlargement of the capacity of the air-cells (air vesicles) by dilation of their walls; the walls after a time degenerate, and finally give way, and thus form a communication with other air-cells. The second form is called interlobular emphysema, and follows the first. In this variety the air finds its way into the lung tissue between the air-cells, or, as its name indicates, in the tissue between the small lobules.

Symptoms.—Almost every experienced horseman is able to detect "heaves." The peculiar movement of the flanks and abdomen point out the ailment at once. But in recent cases the affected animal does not always exhibit the characteristic breathing unless exerted to a certain extent. The cough which accompanies this disease is peculiar to it. It is difficult to describe, but the sound is short, and something like a grunt.

When air is inspired, that is, taken in, it appears to be done in the same manner as in health; it may possibly be done a little quicker than natural, but not enough to attract any notice. It is when the act of expiration (or expelling the air from the lungs) is performed that the great change in the breathing is perceptible. It must now be remembered that the lungs have lost much of their power of contracting on account of the degeneration of the walls of the air-cells, and also on account of the paralysis of muscular tissue before mentioned. The air passes into them freely, but the power to expel it is lost to a great extent by the lungs; therefore the abdominal muscles are brought into play. These muscles, especially in the region of the flank, are seen to

contract, then pause for a moment, then complete the act of contracting, thus making a double bellows-like movement at each expiration, a sort of jerky motion with every breath. When the animal is exerted a wheezing noise accompanies the breathing. This noise may be heard to a less extent when the animal is at rest if the ear be applied to the chest.

As before remarked, indigestion is always present in these cases. The animal has a depraved appetite, as shown by a desire to eat dirt and soiled bedding, which he often devours in preference to the clean food in the trough or manger. The stomach is liable to be overloaded with indigestible food. The abdomen may assume that form called "pot-bellied." The animal frequently passes wind, which is of a very offensive odor. Attacks of colic may occur, which in some cases are fatal. When first put to work dung is passed frequently; the bowels are often loose. The animal can not stand much work, as the muscular system is soft. Round chested horses are said to be predisposed to the disease, and it is certain that in cases of long standing the chest usually becomes rounder than natural.

Certain "smart" individuals become very expert in managing a horse affected with "heaves" in suppressing the symptoms for a short time. They take advantage of the fact that the breathing is much easier when the stomach and intestines are empty. They also resort to the use of medicines that have a depressiug effect. When the veterinarian is examining a horse for soundness, and he suspects that the animal has been "fixed," he usually gives the horse as much water as he will drink and then has him ridden or driven rapidly up a hill or on a heavy road. This will bring out the characteristic breathing of "heaves." All broken-winded horses have the cough peculiar to the affection, but it is not regular. A considerable time may elapse before it is heard and then it may come on in paroxysms, especially when first brought out of the stable into the cold air, or when excited by work, or after a drink of cold water. The cough is usually the first symptom of the disease.

Treatment.—When the disease is established there is no cure for it. Proper attention paid to the diet will relieve the distressing symptoms to a certain extent, but they will undoubtedly re-appear in their intensity the first time the animal overloads the stomach or is allowed food of bad quality. Putting aside all theories in regard to the primary cause of the affection, it is generally admitted that it is closely allied to derangement of the digestive organs, most particularly the stomach. This being the fact, it is but reasonable to infer that if the animal is allowed nothing but food of the best quality the predisposition to "heaves" is lessened. Clover hay and bulky food generally, which, as a rule, contains but little nutriment, have much to do with the cause of the disease, and therefore should be entirely omitted when the animal is affected, as well as before. A high authority asserts that the disease is unknown where clover hay is never used. The diet should be confined to food of the best quality and in the smallest quantity. The bad

effect of moldy or dusty hay, fodder, or food of any kind can not be overestimated. A small quantity of the best hay once a day is sufficient. The animal should invariably be watered before feeding; never directly after a meal. It is a good plan to slightly dampen the food to allay the dust. The animal should not be worked immediately after a meal. Exertion, when the stomach is full, invariably aggravates the symptoms. Turning on pasture gives relief. Carrots, potatoes, or turnips chopped and mixed with oats or corn are a good diet.

Many different medicines have been tried, but not one has yet been discovered that gives even partial satisfaction in the treatment of broken wind. Arsenic, however, is about the only remedy that retains any reputation of being efficacious in palliating the symptoms. It is best administered in the form of the solution of arsenic in hydrochloric acid (Liq. Acidi. Ars.), which should be obtained from the drug store, as it is then of a standard preparation. Each ounce of the solution contains a little over 4½ grains of arsenic. A tablespoonful mixed with bran and oats three times a day for about two weeks, then about twice a day for about two weeks longer, then once a day for several weeks, is a good way to give this remedy. If the bowels do not act regularly, a pint of raw linseed oil may be given once or twice a month. It must, however, be borne in mind that all medical treatment is of secondary consideration; careful attention paid to the diet is of greatest importance. Broken-winded animals should not be used for breeding purposes. A predisposition to the disease is likely to be inherited.

CHRONIC COUGH.

A chronic cough may succeed the acute diseases of the respiratory organs, such as pneumonia, bronchitis, laryngitis, etc. It accompanies chronic roaring, chronic bronchitis, broken wind. It may succeed influenza. As previously stated, cough is but a symptom and not a disease in itself. Chronic cough is occasionally associated with diseases other than those of the organs of respiration. It may be a symptom of chronic indigestion or of worms. In such cases it is caused by a reflex nervous irritation. The proper treatment in all cases of chronic cough is to ascertain the nature of the disease of which it is a symptom, and then cure the disease if possible, and the cough will cease.

The treatment of the affections will be found under their appropriate heads, to which the reader is referred.

PLEURODYNIA.

This is a form of rheumatism that affects the intercostal muscles, that is, the muscles between the ribs. The apparent symptoms are very similar to those of pleurisy. The animal is stiff and not inclined to turn around; the ribs are kept in a fixed state as much as possible. If the head is pulled round suddenly, or the affected side struck with the hand, or if the spaces between the ribs are pressed with the fingers the animal will flinch and perhaps emit a grunt or groan expressive of

much pain. It is distinguished from pleurisy by the absence of fever, cough, the friction-sound, the effusion into the chest, and by the existence of rheumatism in other parts. The treatment for this affection is the same as for rheumatism affecting other parts.

WOUNDS PENETRATING THE WALLS OF THE CHEST.

According to the theory of some teachers of physiology, when an opening is made in the wall of the chest, sufficient for the admission of air, a collapse of the lung should occur. But in practice this is not always found to be the case. The writer has attended several such cases, and one in particular was not seen until about twelve hours after the wound was inflicted. It is true the breathing was considerably altered, but no bad effect followed the admission of air into the thoracic cavity. The wound was closed and treated according to the method of treating wounds generally, and a speedy and perfect recovery was made. The wound may not penetrate the pleura; in such cases no great harm is done, but if the pleura is penetrated pleurisy may follow, and even pneumonia if the wound involves the lung.

The condition called pneumo-thorax means air in the chest. This may be due to a wound in the wall of the chest, or it may be due to a broken rib, the sharp edge of which wounds the lung sufficiently to allow air to escape into the space between the lung and ribs, which is naturally a vacuum. Air gaining access to the thoracic cavity through a wound may have a peculiar effect. The wound may be so made that when the walls of the chest are dilating a little air is sucked in, but during the contraction of the wall the contained air presses against the torn part in such a manner as to entirely close the wound; thus a small quantity of air gains access with each inspiration, while none is allowed to escape until the lung is pressed into a very small compass and forced into the anterior part of the chest. The same thing may occur from a broken rib inflicting a wound in the lung. In this form the air gains access from the lung, and there may not even be an opening in the walls of the chest. Decomposition of the fluid in hydro-thorax, with consequent generation of gases, is said to have caused the same condition. In such cases the air is generally absorbed, and a spontaneous cure is the result. But when the symptoms are urgent it is recommended that the air be removed by a trocar and canula or by an aspirator.

The treatment of wounds that penetrate the thoracic cavity should, for the foregoing reason, be prompt. It should be quickly ascertained whether or not a foreign body remains in the wound, then it should be thoroughly cleaned with a solution of carbolic acid one part in water forty parts. The wound should then be closed immediately. If it is an incised wound it should be closed with sutures; if torn or lacerated, a bandage around the chest over the dressing is the best plan. At all events, air must be prevented from getting into the chest, as soon and as effectually as possible. The after treatment of the wound should

principally consist in keeping the parts clean with the solution of carbolic acid, and applying fresh dressing as often as required to keep the wound in a healthy condition. Care should be taken that the discharges from the wound have an outlet in the most dependent part. (See wounds.) If the wound causes much pain it should be allayed with a dose of tincture of opium in raw linseed oil, as advised in the treatment of pleurisy. If pleurisy supervenes, it should be treated as advised under that head.

THUMPS—SPASM OF THE DIAPHRAGM.

"Thumps" is generally thought to be, by the inexperienced, a palpitation of the heart. While it is true that palpitation of the heart is sometimes called "thumps," it must not be confounded with the affection under consideration.

In the beginning of this article on the diseases of the organs of respiration the diaphragm was briefly referred to as the principal and essential muscle of respiration. Spasmodic or irregular contractions of it in man are manifested by what is familiarly known as hiccoughs. Thumps in the horse is identical with hiccoughs in man, although the peculiar noise is not made in the throat of the horse in all cases.

There should be no difficulty in distinguishing this affection from palpitation of the heart. The jerky motion affects the whole body, and is not confined to the region of the heart. If one hand is placed on the body at about the middle of the last rib, while the other hand is placed over the heart behind the left elbow it will be easily demonstrated that there is no connection between the thumping or jerking of the diaphragm and the beating of the heart. If the ear is placed against the body it will be discovered that the sound is made posterior to the region of the heart. In fact, when the animal is affected with spasms of the diaphragm the beating of the heart is usually much weaker and less preceptible than natural. Thumps is produced by the same causes which produce congestion of the lungs, and is often seen in connection with the latter disease. If not relieved, death usually results from congestion of the lungs, as the breathing is interfered with by the inordinate action of this the principal muscle of inspiration so much that proper aeration of the blood can not take place. The treatment should be precisely the same as prescribed for congestion of the lungs.

RUPTURE OF THE DIAPHRAGM.

Post mortem examinations reveal a great many instances of rupture of the diaphragm. It is the general opinion among veterinarians that this takes place after death, and is due to the generation of gases in the decomposing carcass, which distend the intestines so that the diaphragm is ruptured by the great pressure against it. Of course it is possible for it to happen before death and by strangulating the knuckle of intestine that may be in the rupture cause death; but there are no symptoms by which it may be diagnosed.

POSITION OF THE LEFT LUNG.

PLATE XV.

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DISEASES OF THE GENERATIVE ORGANS.

By Dr. JAMES LAW, F. R. C. V. S.,
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CONGESTION AND INFLAMMATION OF THE TESTICLES—ORCHITIS.

In the prime of life, in vigorous health, and on stimulating food stallions are subject to congestion of the testicles, which become swollen, hot, and tender, but without any active inflammation. A reduction of the grain in the feed, the administration of 1 or 2 ounces of Glauber salts daily in the food, and the bathing of the affected organs daily with tepid water or alum water will usually restore them to a healthy condition.

When the factors producing congestion are extraordinarily potent, when there has been frequent copulation and heavy grain feeding, when the weather is warm and the animal has had little exercise, and when the proximity of other horses or mares excite the generative instinct without gratification, this congestion may grow to actual inflammation. Among the other causes of orchitis are blows and penetrating wounds implicating the testicles, abrasions of the scrotum by a chain or rope passing inside the thigh, contusions and frictions on the gland under rapid paces or heavy draught, compression of the blood-vessels of the spermatic cord by the inguinal ring under the same circumstances, and finally, sympathetic disturbance in cases of disease of the kidneys, bladder, or urethra. Stimulants of the generative functions, like rue, savin, tansy, cantharides, and damiana may also be accessory causes of congestion and inflammation. Finally, certain specific diseases like *mal du coït*, glanders, and tuberculosis, localized in the testicles, will cause inflammation. Apart from actual wounds of the parts the symptoms of orchitis are swelling, heat, and tenderness of the testicles, straddling with the hind legs alike in standing and walking, stiffness and dragging of the hind limbs or of the limb on the affected side, arching of the loins, abdominal pain, manifested by glancing back at the flank, with more or less fever, elevated body temperature, accelerated pulse and breathing, inappetence, and dullness. In bad cases the scanty urine may be reddish and the swelling may extend to the skin and envelopes of the testicle, which may become thickened and doughy, pitting on pressure. The swelling may be so much greater in the con-

voluted excretory duct along the upper border of the testicle as to suggest the presence of a second stone. Even in the more violent attacks the intense suffering abates somewhat on the second or third day. If it lasts longer it is likely to give rise to the formation of matter (abscess). In exceptional cases the testicle is struck with gangrene or death. Improvement may go on slowly to complete recovery, or the malady may subside into a subacute and chronic form with induration. Matter (abscess) may be recognized by the presence of a soft spot, where pressure with two fingers will detect fluctuation from one to the other. When there is liquid exudation into the scrotum, or sack, fluctuation may also be felt, but the liquid can be made out to be around the testicle and can be pressed up into the abdomen through the inguinal canal. When abscess occurs in the cord the matter may escape into the scrotal sack and cavity of the abdomen and pyæmia may follow.

Treatment consists in perfect rest and quietude, the administration of a purgative (1 pound to 1½ pounds Glauber's salts), and the local application of an astringent lotion (acetate of lead 2 drams, extract of belladonna 2 drams, and water 1 quart) upon soft rags or cotton wool, kept in contact with the part by a suspensory bandage. This bandage, of great value for support, may be made nearly triangular and tied to a girth around the loins and to the upper part of the same surcingle by two bands carried backward and upward between the thighs. In severe cases scarifications one-fourth inch deep serve to relieve vascular tension. When abscess is threatened its formation may be favored by warm fomentations or poultices, and on the occurrence of fluctuation the knife may be employed to give free escape to the pus. The resulting cavity may be injected daily with a weak carbolic acid lotion, or salol may be introduced. The same agents may be used on a gland threatened with gangrene, but its prompt removal by castration is to be preferred, antiseptics being applied freely to the resulting cavity.

SARCOCELE.

This is an enlarged and indurated condition of the gland resulting from chronic inflammation, though it is often associated with a specific deposit like glanders. In this condition the natural structure of the gland has given place to embryonal tissue (small, round cells, with a few fibrous bundles), and its restoration to health is very improbable. Apart from active inflammation, it may increase very slowly. The diseased testicle is enlarged, firm, non-elastic, and comparatively insensible. The skin of the scrotum is tense, and it may be œdematous (pitting on pressure), as are the deeper envelopes and spermatic cord. If liquid is present in the sack the symptoms are masked somewhat. As it increases it causes awkward, straddling, dragging movement of the hind limbs, or lameness on the affected side. The spermatic cord often increases at the same time with the testicle, and the inguinal

ring being thereby stretched and enlarged, a portion of intestine may escape into the sack, complicating the disease with hernia.

The only rational and effective treatment is castration, and even this may not succeed when the disease is specific (glanders, tuberculosis).

HYDROCELE—DROPSY OF THE SCROTUM.

This may be merely an accompaniment of dropsy of the abdomen, the cavity of which is continuous with that of the scrotum in horses. It may be the result, however, of local disease in the testicle, spermatic cord, or walls of the sack.

The *symptoms* are enlargement of the scrotum, and fluctuation under the fingers, the testicle being recognized as floating in water. By pressure the liquid is forced, in a slow stream, and with a perceptible thrill, into the abdomen. Sometimes the cord, or the scrotum, are thickened and pit on pressure.

Treatment may be the same as for ascites, yet when the effusion has resulted from inflammation of the testicle or cord, astringent applications (chalk and vinegar) may be applied to these. Then if the liquid is not re-absorbed under diuretics and tonics, it may be drawn off through the nozzle of a hypodermic syringe, which has been first passed through carbolic acid. In geldings it is best to dissect out the sacks.

VARICOCELE.

This is an enlargement of the venous network of the spermatic cord, and gives rise to general thickening of the cord from the testicle up to the ring. The same astringent dressings may be tried as in hydrocele, and this failing castration may be resorted to.

ABNORMAL NUMBER OF TESTICLES.

Sometimes one or both testicles are wanting; in most such cases, however, they are merely partially developed, and retained in the inguinal canal, or the abdomen (cryptorchid). In rare cases there may be a third testicle, the animal becoming to this extent a double monster. Teeth, hair, and other indications of a second fœtus have likewise been found in the testicle, or scrotum.

DEGENERATION OF THE TESTICLES.

The testicles may become the seat of fibrous, calcareous, fatty, cartilaginous, or cystic degeneration, for all of which the appropriate treatment is castration. They also become the seat of cancer, glanders, or tuberculosis, and castration is requisite, though with less hope of arresting the disease. Finally they may become infested with cystic tape-worms, or the armed round worm *(sclerostomum equinum)*.

WARTS ON THE PENIS.

These are best removed by seizing them between the thumb and forefinger and twisting them off. Or they may be cut off with scissors and the roots cauterized with nitrate of silver.

DEGENERATION OF PENIS—PAPILLOMA, EPITHELIOMA.

The penis of the horse is subject to great cauliflower-like growths on its free end, which extend back into the substance of the organ, obstruct the passage of urine, and cause very fetid discharges. The only resort is to cut them off, together with whatever portion of the penis has become diseased and indurated. The operation, which should be performed by a veterinary surgeon, consists in cutting through the organ from its upper to its lower aspect, twisting or tying the two dorsal arteries and leaving the urethra longer by half an inch to 1 inch than the adjacent structures.

EXTRAVASATION OF BLOOD IN THE PENIS.

As the result of kicks, blows, or of forcible striking of the yard on the thighs of the mare which it has failed to enter, the penis may become the seat of effusion of blood from one or more ruptured blood-vessels. This gives rise to a more or less extensive swelling on one or more sides, followed by some heat and inflammation, and on recovery a serious curving of the organ. The treatment in the early stages may be the application of lotions, of alum, or other astringents, to limit the amount of effusion and favor absorption. The penis should be suspended in a sling.

PARALYSIS OF THE PENIS.

This results from blows and other injuries, and also in some cases from too frequent and exhausting service. The yard hangs from the sheath, flaccid, pendulous, and often cold. The passage of urine occurs with lessened force, and especially without the final jets. In cases of local injury the inflammation should first be subdued by astringent and emollient lotions, and in all cases the system should be invigorated by nourishing diet, while 30-grain doses of nux vomica are given twice a day. Finally, a weak current of electricity sent through the penis from just beneath the anus to the free portion of the yard, continued for ten or fifteen minutes and repeated daily, may prove successful.

SELF-ABUSE—MASTURBATION.

Some stallions acquire this vicious habit, stimulating the sexual instinct to the discharge of semen, by rubbing the penis against the belly or between the fore limbs. The only remedy is a mechanical one, the fixing of a net under the penis in such fashion as will prevent the extension of the penis, or so prick the organ as to compel the animal to desist through pain.

This is propagated, like syphilis, by the act of copulation and affects stallions and mares. It has been long known in Northern Africa, Arabia, and Continental Europe. It was imported into Illinois in 1882 in a Percheron horse.

From one to ten days after copulation, or in stallions it may be after some weeks, there is irritation, swelling, and a livid redness of the external organs of generation, sometimes followed by the eruption of small blisters one-fifth of an inch across, on the penis, the vulva, clitoris, and vagina, and the subsequent rupture of these vesicles and the formation of ulcers or small open sores. Vesicles have not been noticed in this disease in the dry climate of Illinois. In the mare there is frequent contraction of the vulva, urination, and the discharge of a watery and later a thick viscid liquid of a whitish, yellowish, or reddish color, which collects on and soils the tail. The swelling of the vulva increases and decreases alternately, affecting one part more than another and giving a distorted appearance to the opening. The affection of the skin leads to the appearance of circular white spots, which may remain distinct or coalesce into extensive patches which persist for months. This with the soiled tail, red, swollen, puckered, and distorted vulva, and an increasing weakness and paralysis of the hind limbs, serve to characterize the affection. The mare rarely breeds, but will take the male and thus propagate the disease. The disease winds up with great emaciation and stupidity, and death in four months to two years. In horses which serve few mares there may be only swelling of the sheath for a year, but with frequent copulation the progress is more rapid. The penis may be enlarged, shrunken, or distorted; the testicles are unusually pendant and may be enlarged or wasted and flabby; the skin, as in the mare, shows white spots and patches. Later the penis becomes partially paralyzed and hangs out of the sheath; swelling of the adjacent lymphatic glands (in the groin) and even of distant ones, and of the skin, appear, and the hind limbs become weak and unsteady. In some instances the glands under the jaw swell, and a discharge flows from the nose as in glanders. In other cases the itching of the skin leads to gnawing and extensive sores. Weakness, emaciation, and stupidity increase until death, in fatal cases, yet the sexual desire does not seem to fail. A stallion without sense to eat except when food was put in his mouth, would still neigh and seek to follow mares. In mild cases an apparent recovery may ensue, and through such animals the disease is propagated to new localities to be roused into activity and extension under the stimulus of service. The diseased nerve centers are the seat of cryptogamic growths. (Thannhoffer).

Treatment of the malady has proved eminently unsatisfactory It belongs to the purely contagious diseases, and should be stamped out by the remorseless slaughter or castration of every horse or mare that has had sexual congress with a diseased animal. A provision for Govern-

ment indemnity for the animals so destroyed or castrated, and a severe penalty for putting any such animal to breeding, would serve as effectual accessory resorts.

CASTRATION OF STALLIONS.

This is usually done at one year old, but may be accomplished at a few weeks old, at the expense of an imperfect development of the fore parts. The simplicity and safety of the operation are greatest in the young. The delay till two, three, or four years old will secure a better development and carriage of the fore parts. The essential part of castration is the safe removal or destruction of the testicle and the arrest or prevention of bleeding from the spermatic artery found in the anterior part of the cord. Into the many methods of accomplishing this, limited space forbids us to enter here, so that the method most commonly adopted, castration by clamps, will alone be noticed. The animal having been thrown on his left side, and the right hind foot drawn up on the shoulder, the exposed scrotum, penis, and sheath are washed with soap and water, any concretion of sebum being carefully removed from the bilocular cavity in the end of the penis. The left spermatic cord, just above the testicle, is now seized in the left hand, so as to render the skin tense over the stone, and the right hand, armed with the knife, makes an incision from before backward, about three-fourths of an inch from and parallel to the median line between the thighs, deep enough to expose the testicle and long enough to allow that organ to start out through the skin. At the moment of making this incision the left hand must grasp the cord very firmly, otherwise the sudden retraction of the testicle by the cremaster muscle may draw it out of the hand and upwards through the canal and even into the abdomen. In a few seconds, when the struggle and retraction have ceased, the knife is inserted through the cord, between its anterior and posterior portions and the latter, the one which the muscle retracts, is cut completely through. The testicle will now hang limp and there is no longer any tendency to retraction. It should be pulled down until it will no longer hang loose below the wound and the clamps applied around the still attached portion of the cord, close up to the skin. The clamps, which may be made of any tough wood, are grooved along the center of the surfaces opposed to each other, thereby fulfilling two important indications, (*a*) enabling the clamps to hold more securely and (*b*) providing for the application of an antiseptic to the cord. For this purpose a dram of sulphate of copper may be mixed with an ounce of lard and pressed into the groove in the face of each clamp. In applying the clamp over the cord it should be drawn so close with pincers as to press out all blood from the compressed cord and destroy its vitality, and the cord applied upon the compressing clamps should be so hard-twined that it will not stretch later and slacken the hold. When the clamp has been fixed the testicle is cut off one-half to 1 inch below it,

and the clamp may be left thus for twenty-four hours; then, by cutting the cord around one end of the clamp, the latter may be opened and the stump liberated, without any danger of bleeding. Should the stump hang out of the wound it should be pushed inside with the finger and left there. The wound should begin to discharge white matter on the second day in hot weather, or the third in cold, and from that time a good recovery may be expected.

CONDITIONS FAVORABLE TO SUCCESSFUL CASTRATION.

The young horse suffers less from castration than the old, and very rarely perishes. Good health in the subject is all important. Castration should never be attempted during the prevalence of strangles, influenza, catarrhal fever, contagious pleurisy, bronchitis, pneumonia, purpura hæmorrhagica, or other specific disease, nor on subjects that have been kept in close, illy ventilated, filthy buildings, where the system is liable to have been charged with putrid bacteria or other products. Warm weather is to be preferred to cold, but the fly time should be avoided or the flies kept at a distance by the application of a watery solution of tar, carbolic acid, or camphor to the wound.

CASTRATION OF CRYPTORCHIDS (RIDGLINGS).

This is the removal of a testicle or testicles that have failed to descend into the scrotum, but have been detained in the inguinal canal or inside the abdomen. The manipulation requires an accurate anatomical knowledge of the parts, and special skill, experience, and manual dexterity, and can not be made clear to the unprofessional mind in a short notice. It consists, however, in the discovery and removal of the missing gland by exploring through the natural channel (the inguinal canal), or, in case it is absent, through the inguinal ring or through an artificial opening made in front and above that channel between the abdominal muscles and the strong fascia on the inner side of the thigh (Poupart's ligament). Whatever method is used, the skin, hands, and instruments should be rendered aseptic with a solution of murcuric chloride 1 part; water 2,000 parts (a carbolic acid lotion for the instruments), and the spermatic cord is best torn through by the ecraseur. In many such cases, too, it is desirable to sew up the external wound and keep the animal still, to favor healing of the wound by adhesion.

PAIN AFTER CASTRATION.

Some horses are pained and very restless for some hours after castration, and this may extend to cramps of the bowels and violent colic. This is best kept in check by carefully rubbing the patient dry when he rises from the operation, and then leading him in hand for some time. If the pain still persists a dose of laudanum (1 ounce for an adult) may be given.

BLEEDING AFTER CASTRATION.

Bleeding from the wound in the scrotum and from the little artery in the posterior portion of the spermatic cord always occurs, and in warm weather may appear to be quite free. It scarcely ever lasts, however, over fifteen minutes, and is easily checked by dashing cold water against the part.

Bleeding from the spermatic artery in the anterior part of the cord may be dangerous when due precaution has not been taken to prevent it. In such case the stump of the cord should be sought for and the artery twisted with artery forceps or tied with a silk thread. If the stump can not be found, pledgets of tow wet with tincture of muriate of iron may be stuffed into the canal to favor the formation of clot and the closure of the artery.

STRANGULATED SPERMATIC CORD.

If in castration the cord is left too long, so as to hang out of the wound, the skin wound in contracting grasps and strangles it, preventing the free return of blood and causing a steadily advancing swelling. In addition the cord becomes adherent to the lips of the wound in the skin, whence it derives an increased supply of blood, and is thereby stimulated to more rapid swelling. The subject walks stiffly, with straddling gait, loses appetite, and has a rapid pulse and high fever. Examination of the wound discloses the partial closure of the skin wound, and the protrusion from its lips of the end of the cord, red, tense, and varying in size from a hazel-nut upward. If there is no material swelling and little protrusion the wound may be enlarged with the knife and the end of the cord broken loose from any connection with the skin, and pushed up inside. If the swelling is larger the mass constitutes a tumor, and must be removed. (See below.)

SWELLING OF THE SHEATH, PENIS, AND ABDOMEN.

This occurs in certain unhealthy states of the system, in unhealthy seasons, as the result of operating without cleansing the sheath and penis, or of keeping the subject in a filthy, impure building, as the result of infecting the wound by hands or instruments bearing septic bacteria, or as the result of premature closure of the wound, and imprisonment of matter.

Pure air and cleanliness of groin and wound are to be secured. Antiseptics, like the mercuric chloride lotion (1 part to 2,000) are to be applied to the parts; the wound, if closed, is to be opened anew, any accumulated matter or blood washed out, and the antiseptic liquid freely applied. The most tense or dependent parts of the swelling in sheath or penis, or beneath the belly, should be pricked at intervals of 3 or 4 inches, and to a depth of half an inch, and antiseptics freely used to the surface. Fomentations with warm water may also be used

to favor oozing from the incisions and to encourage the formation of white matter in the original wounds, which must not be allowed to close again at once. A free, cream-like discharge implies a healthy action in the sore, and is the precursor of recovery.

PHYMOSIS AND PARAPHYMOSIS.

In cases of swelling, as above, the penis may be imprisoned within the sheath (phymosis) or protruded and swollen so that it can not be retracted into it (paraphymosis). In these cases the treatment indicated above, and especially the scarifications, will prove a useful preliminary resort. The use of astringent lotions is always desirable, and in case of the protruded penis the application of an elastic or simple linen bandage, so as to press out the blood and accumulated fluid, will enable the operator to return it.

TUMORS ON THE SPERMATIC CORD.

These are due to rough handling or dragging upon the cord in castration, to strangulation of unduly long cords in the external wound, to adhesion of the end of the cord to the skin, to inflammation of the cord succeeding exposure to cold or wet, or to the presence of septic or irritant matters. These tumors give rise to a stiff, straddling gait, and may be felt as hard masses in the groin connected above with the cord. They may continue to grow slowly for many years until they reach a weight of 15 or 20 pounds, and contract adhesions to all surrounding parts. If disconnected from the skin and inguinal canal they may be removed in the same manner as the testicle, while if larger and firmly adherent to the skin and surrounding parts generally they must be carefully dissected from the parts, the arteries being tied as they are reached and the cord finally torn through with an ecraseur. When the cord has become swollen and indurated up into the abdomen such removal is impossible, though a partial destruction of the mass may still be attempted by passing white hot pointed irons upward toward the inguinal ring in the center of the thickened and indurated cord.

CASTRATION BY THE COVERED OPERATION.

This is only required in case of hernia or protrusion of bowels or omentum into the sack of the scrotum, and consists in the return of the hernia and the application of the caustic clamps over the cord and inner walls of the inguinal canal, so that the walls of the latter become adherent above the clamps, the canal is obliterated, and further protrusion is hindered. For the full description of this and of the operation for hernia in geldings, see article on hernia.

CASTRATION OF THE MARE.

Castration is a much more dangerous operation in the mare than in the females of other domesticated quadrupeds, and should never be resorted

to except in animals that become unmanageable on the recurrence of heat, and that will not breed or that are utterly unsuited to breeding. Formerly the operation was extensively practiced in Europe, the incision being made through the flank, and a large proportion of the subjects perishing. By operating through the vagina the risk can be largely obviated, as the danger of unhealthy inflammation in the wound is greatly lessened. The animal should be fixed in a trevis, with each foot fixed to a post and a sling placed under the body, or, better, it may be thrown and put under chloroform. The manual operation demands special professional knowledge and skill, but it consists essentially in making an opening through the roof of the vagina just above the neck of the womb, then following with the hand each horn of the womb until the ovary on that side is reached and grasped between the lips of forceps and twisted off. It might be torn off by an ecraseur especially constructed for the purpose. The straining that follows the operation may be checked by ounce doses of laudanum, and any risk of protrusion of the bowels may be obviated by applying the truss advised to prevent eversion of the womb. To further prevent the pressure of the abdominal contents against the vaginal wound the mare should be tied short and high for twenty-four or forty-eight hours, after which I have found it best to remove the truss and allow the privilege of lying down. Another important point is to give bran mashes and other laxative diet only, and in moderate quantity, for a fortnight, and to unload the rectum by copious injections of warm water in case it should threaten to become impacted.

STERILITY.

Sterility may be in the male or in the female. If due to the stallion, then all the mares put to him remain barren; if due to the mare, she alone fails to conceive.

In the stallion sterility may be due to the following causes: (*a*) Imperfect development of the testicles, as in cases in which they are retained within the abdomen; (*b*) inflammation of the testicles, resulting in induration; (*c*) fatty degeneration of the testicles, in stallions liberally fed on starchy food and not sufficiently exercised; (*d*) fatty degeneration of the excretory ducts of the testicles (*vasa deferentia*); (*e*) inflammation or ulceration of these ducts; (*f*) inflammation or ulceration of the mucous membrane covering the penis; (*g*) injuries to the penis from blows (often causing paralysis); (*h*) warty growths on the end of the penis; (*i*) tumors of other kinds (largely pigmentary) affecting the testicles or penis; (*j*) nervous diseases which abolish the sexual appetite, or that control over the muscles which is essential to the act of coition; (*k*) azoturia with resulting weakness or paralysis of the muscles of the loins or the front of the thigh (above the stifle); (*l*) ossification (anchylosis) of the joints of the back or loins, which renders the animal unable to rear or mount; (*m*) spavins, ringbones,

or other painful affections of the hind limbs, the pain of which in mounting causes the animal to suddenly stop short in the act. In the first three of these only (*a*, *b*, and *c*) is there real sterility in the sense of the non-development or imperfect development of the male vivifying element (spermatozoa). In the other examples the secretion may be perfect in kind and amount, but as copulation is prevented it can not reach and impregnate the ovum.

In the mare barrenness is equally due to a variety of causes. In a number of breeding studs the proportion of sterile mares has varied from 20 to 40 per cent. It may be due to: (*a*) Imperfect development of the ovary and non-maturation of ova; (*b*) cystic or other tumors of the ovary; (*c*) fatty degeneration of the ovary in very obese, pampered mares; (*d*) fatty degeneration of the excretory tubes of the ovaries (fallopian tubes); (*e*) catarrh of the womb, with muco-purulent discharge; (*f*) irritable condition of the womb, with profuse secretion, straining, and ejection of the semen; (*g*) nervous irritability, leading to the same expulsion of the male element; (*h*) high condition (plethora) with profuse secretion and excitement; (*i*) low condition with imperfect maturation of the ova and lack of sexual desire; (*j*) poor feeding, overwork, and chronic debilitating diseases, as leading to the condition just named; (*k*) closure of the neck of the womb, temporarily by spasm, or permanently by inflammation and induration; (*l*) closure of the entrance to the vagina through imperforate hymen, a rare though not unknown condition in the mare; (*m*) acquired indisposition to breed, seen in old, hard worked mares, which are first put to the stallion when aged; (*n*) change of climate has repeatedly been followed by barrenness; (*o*) hybridity, which in male and female alike, usually entails sterility.

The *treatment* of the majority of these conditions will be found dealt with in other parts of this work, so that it is only necessary here to name them as causes. Some, however, must be specially referred to in this place. Stallions with undescended testicles are beyond the reach of medicine, and should be castrated and devoted to other uses. Indurated testicles may sometimes be remedied in the early stages by smearing with a weak iodine ointment daily for a length of time, and at the same time invigorating the system by liberal feeding and judicious work. Fatty degeneration is best met by an albuminoid diet (wheat bran, cotton-seed meal, rape cake) and constant, well regulated work. Saccharine, starchy and fatty food (potatoes, wheat, corn, etc.) are to be specially avoided. In the mare one diseased and irritable ovary should be removed, to do away with the resulting excitability of the remainder of the generative organs. An irritable womb, with frequent straining and the ejection of a profuse secretion, may sometimes be corrected by a restricted diet and full but well regulated work. Even fatigue will act beneficially in some such cases, hence the practice of the Arab riding his mare to exhaustion just before service. The perspiration in such a case, like the action of a purgative or the abstrac-

tion of blood just before service, benefits, by rendering the blood-vessels less full, by lessening secretion in the womb and elsewhere, and thus counteracting the tendency to the ejection and loss of semen. If these means are ineffectual a full dose of camphor (2 drams) or of salacin may at times assist. Low condition and anæmia demands just the opposite kind of treatment—rich, nourishing, albuminoid food, bitter tonics (gentian), sunshine, gentle exercise, liberal grooming, and supporting treatment generally are here in order. Spasmodic closure of the neck of the womb is common and is easily remedied in the mare by dilatation with the fingers.

The hand, smeared with belladonna ointment and with the fingers drawn into the form of a cone, is introduced through the vagina until the projecting, rounded neck of the womb is felt at its anterior end. This is opened by the careful insertion of one finger at a time until the fingers have been passed through the constricted neck into the open cavity of the womb. The introduction is made with a gentle, rotary motion, and all precipitate violence is avoided, as abrasion, laceration, or other cause of irritation is likely to interfere with the retention of the semen and with impregnation. If the neck of the womb is rigid and unyielding from the induration which follows inflammation—a rare condition in the mare, though common in the cow—more force will be requisite, and it may even be needful to incise the neck to the depth of one-sixth of an inch in four or more opposite directions, prior to forcible dilatation. The incision may be made with a probe-pointed knife, and should be done by a professional man if possible. The subsequent dilatation may be best effected by the slow expansion of sponge or seaweed tents inserted into the narrow canal. In such cases it is best to let the wounds of the neck heal before putting to horse. An imperforate hymen may be freely incised in a crucial manner until the passage will admit the human hand. An ordinary knife may be used for this purpose, and after the operation the stallion may be admitted at once or only after the wounds have healed.

INDICATIONS OF PREGNANCY.

As the mere fact of service by the stallion does not insure pregnancy, it is important that the result should be determined, to save the mare from unnecessary and dangerous work or medication when actually in foal and to obviate wasteful and needless precautions when she is not.

The cessation and non-recurrence of the symptoms of heat (horsing) is a most significant though not infallible sign of conception. If the sexual excitement speedily subsides and the mare persistently refuses the stallion for a month, she is probably pregnant. In very exceptional cases a mare will accept a second or third service after weeks or months, though pregnant, and some mares will refuse the horse persistently, though conception has not taken place, and this in spite of warm weather, good condition of the mare, and liberal feeding. The recur-

rence of heat in the pregnant mare is most likely to take place in hot weather. If heat merely persists an undue length of time after service, or if it re-appears shortly after, in warm weather and in a comparatively idle mare, on good feeding, it is less significant, while the persistent absence of heat under such conditions may be usually accepted as proof of conception.

An unwonted gentleness and docility on the part of a previously irritable or vicious mare, and supervening on service, is an excellent indication of pregnancy, the generative instinct which caused the excitement having been satisfied.

An increase of fat, with softness and flabbiness of muscle, a loss of energy, indisposition for active work, a manifestation of laziness, indeed, and of fatigue early and easily induced, when preceded by service, will usually imply conception.

Enlargement of the abdomen, especially in its lower third, with slight falling in beneath the loins and hollowness of the back are significant symptoms, though they may be entirely absent. Swelling and firmness of the udder, with the smoothing out of its wrinkles, is a suggestive sign, even though it appears only at intervals during gestation.

A steady increase in weight (1½ pounds daily) about the fourth or fifth month is a useful indication of pregnancy. So is a swollen and red or bluish-red appearance of the vaginal mucous membrane.

From the seventh or eighth month onward the foal may be felt by the hand (palm or knuckles) pressed into the abdomen in front of the left stifle. The sudden push displaces the foal toward the opposite side of the womb, and as it floats back its hard body is felt to strike against the hand. If the pressure is maintained the movements of the live foal are felt, and especially in the morning and after a drink of cold water, or during feeding. A drink of cold water will often stimulate the fœtus to movements that may be seen by the eye, but an excess of iced water may prove injurious, even to the causing of abortion. Cold water dashed on the belly has a similar effect on the foetus and equally endangers abortion.

Examination of the uterus with the oiled hand introduced into the rectum is still more satisfactory, and if cautiously conducted no more dangerous. The rectum must be first emptied and then the hand carried forward until it reaches the front edge of the pelvic bones below, and pressed downward to ascertain the size and outline of the womb. In the unimpregnated state the vagina and womb can be felt as a single rounded tube, dividing in front to two smaller tubes (the horns of the womb). In the pregnant mare not only the body of the womb is enlarged, but still more so one of the horns (right or left), and on compression the latter is found to contain a hard, nodular body, floating in a liquid, which in the latter half of gestation may be stimulated by gentle pressure to manifest spontaneous movements. By this method the presence of the fœtus may be determined as early as the third month.

If the complete natural outline of the virgin womb can not be made out, careful examination should always be made on the right and left side for the enlarged horn and its living contents. Should there still be difficulty the mare should be placed on an inclined plane, with her hind parts lowest, and two assistants, standing on opposite sides of the body, should raise the lower part of the abdomen by a sheet passed beneath it. Finally the ear or stethoscope applied on the wall of the abdomen in front of the stifle may detect the beating of the fœtal heart (one hundred and twenty-five per minute) and a blowing sound (the uterine sough), much less rapid and corresponding to the number of the pulse of the dam. It is heard most satisfactorily after the sixth or eighth month and in the absence of active rumbling of the bowels of the dam.

DURATION OF PREGNANCY.

Mares usually go about eleven months with young, though first pregnancies often last a year. Foals have lived when born at the three hundredth day, so with others carried till the four hundredth day. With the longer pregnancies there is a greater probability of male offspring.

HYGIENE OF THE PREGNANT MARE.

The pregnant mare should not be exposed to teasing by a young and ardent stallion, nor should she be overworked or fatigued, particularly under the saddle or on uneven ground. Yet exercise is beneficial to both mother and offspring, and in the absence of moderate work the breeding mare should be kept in a lot where she can take exercise at will.

The food should be liberal, but not fattening, oats, bran, sound hay, and other foods rich in the principles which form flesh and bone being especially indicated. All aliments that tend to indigestion are to be especially avoided. Thus rank, aqueous, rapidly grown grass and other green food, partially ripe rye grass, millet, Hungarian grass, vetches, pease, beans, or maize are objectionable, as is over-ripe fibrous, innutritious hay, or that which has been injured and rendered musty by wet, or that which is infested with smut or ergot. Food that tends to costiveness should be avoided. Water given often, and at a temperature considerably above freezing, will avoid the dangers of indigestions and abortions which result from taking too much ice-cold water at one time. Very cold or frozen food is objectionable in the same sense. Severe surgical operations and medicines that act violently on the womb, bowels, or kidneys are to be avoided as being liable to cause abortion. Constipation should be corrected, if possible, by bran mashes, carrots, or beets, seconded by excercise, and if a medicinal laxative is required it should be olive oil or other equally bland agent.

The stall of the pregnant mare should not be too narrow so as to cramp her when lying down, or to entail violent efforts in getting up,

and it should not slope too much from the front backward, as this throws the weight of the uterus back on the pelvis and endangers protrusions and even abortion. Violent mental impressions are to be avoided, for though the majority of mares are not affected thereby, yet a certain number are so profoundly impressed that peculiarities and distortions are entailed on the offspring. Hence, there is wisdom shown in banishing parti-colored or objectionably tinted animals, and those that show deformities or faulty conformation. Hence, too, the importance of preventing prolonged acute suffering by the pregnant mare, as certain troubles of the eyes, feet, and joints in the foals have been clearly traced to the concentration of the mother's mind on corresponding injured organs in herself. Sire and dam alike tend to reproduce their personal defects which predispose to disease, but the dam is far more likely to perpetuate the evil in her progeny which was carried while she was personally enduring severe suffering caused by such defects. Hence, an active bone spavin or ring-bone, causing lameness, is more objectionable than that in which the inflammation and lameness have both passed, and an active ophthalmia is more to be feared than even an old cataract. For this reason all active diseases in the breeding mare should be soothed and abated at as early a moment as possible.

EXTRA-UTERINE GESTATION.

It is rare in the domestic animals to find the fœtus developed elsewhere than in the womb. The exceptional forms are those in which the sperm of the male, making its way through the womb and Fallopian tubes, impregnates the ovum prior to its escape, and in which the now vitalized and growing ovum, by reason of its gradually increasing size, becomes imprisoned and fails to escape into the womb. The arrest of the ovum may be in the substance of the ovary itself (ovarian pregnancy), in the Fallopian tube (tubal pregnancy), or when by its continuous enlargement it has ruptured its envelopes so that it escapes into the cavity of the abdomen, it may become attached to any part of the serous membrane and draw its nourishment directly from that (abdominal pregnancy). In all such cases there is an increase and enlargement of the capillary blood-vessels at the point to which the embryo has attached itself so as to furnish the needful nutriment for the growing offspring.

All appreciable symptoms are absent, unless from the death of the fœtus, or its interference with normal functions, general disorder and indications of parturition supervene. If these occur later than the natural time for parturition they are the more significant. There may be general malaise, loss of appetite, elevated temperature, accelerated pulse, with or without distinct labor pains. Examination with the oiled hand in the rectum will reveal the womb of the natural unimpregnated size and shape and with both horns of one size. Further exploration may detect an elastic mass apart from the womb and in the

interior of which may be felt the characteristic solid body of the fœtus. If the latter is still alive and can be stimulated to move the evidence is even more perfect. The fœtus may die and be carried for years, its soft structures becoming absorbed so as to leave only the bones, or by pressure it may form a fistulous opening through the abdominal walls, or less frequently through the vagina or rectum. In the latter cases the best course is to favor the expulsion of the foal and to wash out the resulting cavity with a solution of carbolic acid 1 part to water 50 parts. This may be repeated daily. Where there is no spontaneous opening it is injudicous to interfere, as the danger from the retention of the fœtus is less than that from septic fermentations in the enormous fœtal sack when that has been opened to the air.

MOLES—ANIDIAN MONSTERS.

These are evidently products of conception, in which the impregnated ovum has failed to develop naturally, and presents only a chaotic mass of skin, hair, bones, muscles, etc., attached to the inner surface of the womb by an umbilical cord, which is itself often shriveled and wasted. They are usually accompanied by a well-developed fœtus, so that the mole may be looked upon as a twin which has undergone arrest and vitiation of development. They are expelled by the ordinary process of parturition, and usually, at the same time, with the normally developed offspring.

CYSTIC DISEASE OF THE WALLS OF THE WOMB—VESICULAR MOLE.

This condition appears to be due to hypertrophy (enlargement) of the villi on the inner surface of the womb, which become greatly increased in number and hollowed out internally into a series of cysts or pouches containing liquid. Unlike the true mole, therefore, they appear to be disease of the maternal structure of the womb rather than of the product of conception. Rodet, in a case of this kind, which had produced active labor pains, quieted the disorder with anodynes and secured a recovery. Where this is not available attempts may be made to remove the mass with the ecraseur or otherwise, following this up with antiseptic injections, as advised under the last heading.

DROPSY OF THE WOMB.

This appears as a result of some disease of the walls of the womb, but has been frequently observed after sexual congress, and has, therefore, been confounded with pregnancy. The symptoms are those of pregnancy, but without any movements of the fœtus and without the detection of any solid body in the womb when examined with the oiled hand in the rectum. At the end of four or eight months there are signs of parturition or of frequent straining to pass urine, and after a time the liquid is discharged clear and watery, or muddy, thick, and fetid. The hand introduced into the womb can detect neither fœtus

nor fœtal membrane. If the neck of the womb closes the liquid may accumulate a second time, or even a third, if no means are taken to correct the tendency. The best resort is to remove any diseased product that may be found attached to the walls of the womb, and to inject it daily with a warm solution of carbolic acid 2 drams, chloride of zinc one-half dram, water, 1 quart. A course of bitter tonics, gentian 2 drams, sulphate of iron 2 drams, daily, should be given, and a nutritious, easily digested and slightly laxative diet allowed.

DROPSY OF THE AMNIOS.

This differs from simple dropsy of the womb in that the fluid collects in the inner of the two water bags (that in which the foal floats) and not in the otherwise void cavity of the womb. This affection can occur only in the pregnant animal, while dropsy of the womb occurs in the unimpregnated. The blood of the pregnant mare contains an excess of water and a smaller proportion of albumen and red globules, and when this is still further aggravated by poor feeding, and other unhygienic conditions, there is developed the tendency to liquid transudation from the vessels and dropsy. As the watery condition of the blood increases with advancing pregnancy, so dropsy of the amnios is a disease of the last four or five months of gestation. The abdomen is large and pendulous, and the swelling fluctuates under pressure, though the solid body of the fœtus can still be felt to strike against the hand pressed into the swelling. If the hand is introduced into the vagina the womb is found to be tense and round, with the projecting rounded neck effaced, while the hand in the rectum will detect the rounded swollen mass of the womb so firm and tense that the body of the fœtus can not be felt within it. The mare moves weakly and unsteadily on its limbs, having difficulty in supporting the great weight, and in bad cases there may be loss of appetite, stocking (dropsy) of the hind limbs, difficult breathing, and colicky pains. The tension may lead to abortion, or a slow, laborious parturition may occur at the usual time.

Treatment consists in relieving the tension and accumulation by puncturing the fœtal membrane with a cannula and trochar introduced through the neck of the womb and the withdrawal of the trochar so as to leave the canula *in situ*. Or the membranes may be punctured with the finger and the excess of liquid allowed to escape. This may bring on abortion, or the wound may close and gestation continue to the full term. A course of tonics (gentian root 2 drams, sulphate of iron 2 drams, daily) will do much to fortify the system and counteract further excessive effusion.

DROPSY OF THE LIMBS, PERINÆUM, AND ABDOMEN.

The disposition to dropsy often shows itself in the hind and even in in the fore limbs, around and beneath the vulva (perinæum) and beneath the abdomen and chest. The affected parts are swollen and pit

on pressure, but are not especially tender, and subside more or less perfectly under exercise, hand rubbing, and bandages. In obstinate cases rubbing with the following liniment may be resorted to: Compound tincture of iodine, 2 ounces; tannic acid, one-half dram; water, 10 ounces. It does not last over a day or two after parturition.

CRAMPS OF THE HIND LIMBS.

The pressure of the distended womb on the nerves and blood-vessels of the pelvis, besides conducing to dropsy, occasionally causes cramps of the hind limbs. The limb is raised without flexing the joints, the front of the hoof being directed toward the ground, or the spasms occurring intermittently the foot is kicked violently against the ground several times in rapid succession. The muscles are felt to be firm and rigid. The cramps may be promptly relieved by active rubbing, or by walking the animal about, and it does not reappear after parturition.

CONSTIPATION.

This may result from compression by the gravid womb, and is best corrected by a graduated allowance of boiled flaxseed.

PARALYSIS.

The pressure on the nerves of the pelvis is liable to cause paralysis of the hind limbs, or in the mare of the nerve of sight. These are obstinate until after parturition, when they recover spontaneously, or under a course of nux vomica and (locally) stimulating liniments.

PROLONGED RETENTION OF THE FŒTUS (FOAL).

In the mare, though far less frequently than in the cow, parturition may not be completed at term, and the foal may continue to be carried in the womb for a number of months, to the serious, or even fatal injury of the mare. Hamon records one case in which the mare died after carrying the fœtus for seventeen months, and Caillier a similar result after it had been carried twenty-two months. In these cases the fœtus retained its natural form, but in one reported by Gohier, the bones only were left in the womb amid a mass of apparently purulent matter.

The *cause* may be any effective obstruction to the act of parturition, such as lack of contractile power in the womb, unduly strong (inflammatory) adhesions between the womb and the fœtal membranes, wrong presentation of the fœtus, contracted pelvis (from fracture, or disease of the bones), or disease and induration of the neck of the womb.

The mere prolongation of gestation does not necessarily entail the death of the foal, hence the latter has been born alive at the four hundredth day. Even when the foal has perished, putrefaction does not set in unless the membranes (water bags) have been ruptured, and sep-

tic bacteria have been admitted to the interior of the womb. In the latter case a fetid decomposition advances rapidly, and the mare usually perishes from poisoning with the putrid matters absorbed.

At the natural period of parturition preparations are apparently made for that act. The vulva swells and discharges much mucus, the udder enlarges, the belly becomes more pendant, and the animal strains more or less. No progress is made, however; there is not even opening of the neck of the womb, and after a time the symptoms subside. The mare usually refuses the male, yet there are exceptions to this rule. If the neck of the womb has been opened and putrefying changes have set in in its contents, the mare loses appetite and condition, pines, discharges an offensive matter from the generative passages, and dies of inflammation of the womb and putrid infection. In other cases there is a slow wearing out of the strength and the mare finally dies of exhaustion.

The treatment is such as will facilitate the expulsion of the fœtus and its membranes, and the subsequent washing out of the womb with disinfectants. So long as the mouth of the womb is closed, time should be allowed for its natural dilatation, but if this does not come about after a day or two of straining the opening may be smeared with extract of belladonna, and the oiled hand, with the fingers and thumb drawn into the form of a cone, may be inserted by slow oscillating movements into the interior of the womb. The water bags may now be ruptured, any malpresentation rectified (see "Difficult Parturition"), and delivery effected. After removal of the membranes wash out the womb first with tepid water, and then with a solution of 2 ounces of borax in half a gallon of water.

This injection may have to be repeated if a discharge sets in. The same course may be pursued even after prolonged retention. If the soft parts of the fœtus have been absorbed and the bones only left these must be carefully sought for and removed, and subsequent daily injections will be required for some time. In such cases, too, a course of iron tonics (sulphate of iron, 2 drams daily), will be highly beneficial in restoring health and vigor.

ABORTION.

Abortion is, strictly speaking, the expulsion of the impregnated ovum at any period from the date of impregnation until the foal can survive out of the womb. If the foal is advanced enough to live it is *premature parturition*, and in the mare this may occur as early as the tenth month (three hundredth day).

The mare may abort by reason of almost any cause that very profoundly disturbs the system. Hence very violent inflammations of important internal organs (bowels, kidneys, bladder, lungs,) may induce abortion. Profuse diarrhea, whether occurring from the reckless use of purgatives, the consumption of irritants in the food, or a simple indigestion is an effective cause. No less so is acute indigestion with

evolution of gas in the intestines (bloating). The presence of stone in the kidneys, ureters, bladder, or urethra may induce so much sympathetic disorder in the womb as to induce abortion. In exceptional cases wherein mares come in heat during gestation service by the stallion may cause abortion. Blows or pressure on the abdomen, rapid driving or riding of the pregnant mare, especially if she is soft and out of condition from idleness; the brutal use of the spur or whip, and the jolting and straining of travel by rail or boat are prolific causes. Bleeding the pregnant mare, a painful surgical operation, and the throwing and constraint resorted to for an operation are other causes. Traveling on heavy, muddy roads, slips and falls on ice, and jumping must be added. The stimulation of the abdominal organs by a full drink of iced water may precipitate a miscarriage, as may exposure to a cold rain-storm or a very cold night after a warm day. Irritant poisons that act on the urinary or generative organs, such as Spanish flies, rue, savin, tansy, cotton-root bark, ergot of rye or other grasses, the smut of maize and other grain, and various fungi in musty fodder are additional causes. Frosted-food, indigestible food, and above all green succulent vegetables in a frozen state have proved effective factors, and filthy, stagnant water is dangerous. Low condition in the dam and plethora have in opposite ways caused abortion, and hot relaxing stables and lack of exercise strongly conduce to it. The exhaustion of the sire by too frequent service, entailing debility of the offspring and disease of the fœtus or of its envelopes, must be recognized as a further cause.

The symptoms vary mainly according as the abortion is early or late in pregnancy. In the first month or two of pregnancy the mare may miscarry without observable symptoms, and the fact only appears by her coming in heat. If more closely observed a small clot of blood may be found behind her, in which a careful search reveals the rudiments of the foal. If the occurrence is somewhat later in gestation there will be some general disturbance, inappetence, neighing, and straining, and the small body of the fœtus is expelled, enveloped in its membranes. Abortions during the later stages of pregnancy are attended with greater constitutional disturbance, and the process resembles normal parturition, with the aggravation that more effort and straining is requisite to force the fœtus through the comparatively undilatable mouth of the womb. There is the swelling of the vulva, with mucus or even bloody discharge; the abdomen droops, the flanks fall in, the udder fills, the mare looks at her flanks, paws with the fore feet and kicks with the hind, switches the tail, moves around uneasily, lies down and rises, strains, and, as in natural foaling, expels first mucus and blood, then the waters, and finally the fœtus. This may occupy an hour or two, or it may be prolonged for a day or more, the symptoms subsiding for a time, only to reappear with renewed energy. If there is malpresentation of the fœtus it will hinder progress until rectified, as in difficult

parturition. Abortion may also be followed by the same accidents, as flooding, retention of the placenta, and leucorrhœa.

The most important object in an impending abortion is to recognize it at as early a stage as possible, so that it may, if possible, be cut short and prevented. Any general indefinable illness in a pregnant mare should lead to a close examination of the vulva as regards swelling, vascularity of its mucous membrane, and profuse mucous secretion, and above all any streak or staining of blood; also the condition of the udder, if that is congested and swollen. Any such indication, with colicky pains, straining, however little, and active movement of the fœtus or entire absence of movement, are suggestive symptoms and should be duly counteracted.

The changes in the vulva and udder, with a soiled and bloody condition of the tail, may suggest an abortion already accomplished, and the examination with the hand in the vagina may detect the mouth of the womb soft and dilatable, and the interior of the organ slightly filled with a bloody liquid.

Treatment should be preventive if possible, and would embrace the avoidance of all causes mentioned, and particularly of such as may seem to be particularly operative in the particular case. Where abortions have already occurred in a stud, the especial cause, in the matter of food, water, exposure to injuries, overwork, lack of exercise, etc., may often be identified and removed. A most important point is to avoid all causes of constipation, diarrhea, indigestion, bloating, violent purgatives, diuretics or other potent medicines, painful operations, and slippery roads, unless well frosted.

When abortion is imminent the mare should be placed alone in a roomy, dark, quiet stall, and have the straining checked by some sedative. Laudanum is usually at hand and may be given in doses of 1 or 2 ounces, according to size, and repeated after two or three hours, and even daily if necessary. Chloroform or choral hydrate, 3 drams, may be substituted if more convenient. These should be given in a pint or quart of water, to avoid burning the mouth and throat. Or viburnum prunifolium, 1 ounce, may be given and repeated if necessary to prevent straining.

When all measures fail and miscarriage proceeds, all that can be done is to assist in the removal of the fœtus and its membranes, as in ordinary parturition. As in the case of retention of the fœtus, it may be necessary after delivery to employ antiseptic injections into the womb to counteract putrid fermentation. This, however, is less requisite in the mare than in the cow, in which the prevalent contagious abortion must be counteracted by the persistent local use of antiseptics. After abortion a careful hygiene is demanded, especially in the matter of pure air and easily digestible food. The mare should not be served again for a month or longer, and in no case until after all discharge from the vulva has ceased.

SYMPTOMS OF PARTURITION.

As the period of parturition approaches the swelling of the udder bespeaks the coming event, the engorgement in exceptional cases extending forward on the lower surface of the abdomen and even into the hind limbs. For about a week a serous fluid oozes from the teat and concretes as a yellow, wax-like mass around its orifice. About twenty-four hours before the birth this gives place to a whitish, milky liquid, which falls upon and mats the hairs on the inner sides of the legs. Another symptom is enlargement of the vulva, with redness of its lining membrane, and the escape of glairy mucus. The belly droops, the flanks fall in, and the loins may even become depressed. Finally the mare becomes uneasy, stops feeding, looks anxious, whisks her tail, and may lie down and rise again. In many mares this is not repeated, but the mare remains down; violent contractions of the abdominal muscles ensue; after two or three pains the water-bags appear and burst, followed by the fore feet of the foal, with the nose between the knees, and by a few more throes the fœtus is expelled. In other cases the act is accomplished standing. The whole act may not occupy more than five or ten minutes. This, together with the disposition of the mare to avoid observation, renders the act one that is rarely seen by the attendants.

The navel-string, which connects the foal to the membranes, is ruptured when the fœtus falls to the ground, or when the mare rises, if she has been down, and the membranes are expelled a few minutes later.

NATURAL PRESENTATION.

When there is a single foal the common and desirable presentation is with the fore feet first, the nose between the knees, and with the front of the hoofs and knees and the forehead directed upward toward the anus, tail, and croup (Plate IX, fig. 1). In this way the natural curvature of the body of the fœtus corresponds to the curve of the womb and genital passages, and particularly of the bony pelvis, and the foal passes with much greater ease than if it were placed with its back downward toward the udder. When there is a twin birth the second foal usually comes with its hind feet first, and the backs of the legs, the points of the hocks, and the tail and croup are turned upward toward the anus and tail of the mare (Plate IX, fig. 2). In this way, even with a posterior presentation, the curvature of the body of the foal still corresponds to that of the passages, and its expulsion may be quite as easy as in anterior presentation. Any presentation aside from these two may be said to be abnormal and will be considered under "Difficult Parturition."

DIFFICULT PARTURITION.

With natural presentation this is a rare occurrence. The great length of the fore limbs and face entail, in the anterior presentation, the formation of a long cone, which dilates and glides through the

passages with comparative ease. Even with the hind feet first a similar conical form is presented, and the process is rendered easy and quick. Difficulty and danger arise mainly from the act being brought on prematurely before the passages are sufficiently dilated, from narrowing of the pelvic bones or other mechanical obstruction in the passages, from monstrous distortions or duplications in the fœtus, or from the turning back of one of the members so that the elongated conical or wedge-shaped outline is done away with. But prompt as is the normal parturition in the mare, difficult and delayed parturitions are surrounded by special dangers and require unusual precautions and skill. From the proclivity of the mare to unhealthy inflammations of the peritoneum and other abdominal organs, penetrating wounds of the womb or vagina are liable to prove fatal. The contractions of the womb and abdominal walls are so powerful as to exhaust and benumb the arm of the assistant, and to endanger penetrating wounds of the genital organs. By reason of the looser connection of the fœtal membranes with the womb, as compared with those of ruminants, the violent throes early detach these membranes throughout their whole extent, and the foal, being thus separated from the mother and thrown on its own resources, dies at an early stage of any protracted parturition. The foal rarely survives four hours after the onset of parturient throes. From the great length of the limbs and neck of the foal it is extremely difficult to secure and bring up limb or head which has been turned back when it should have been presented. When assistance must be rendered the operator should don a thick woolen undershirt with the sleeves cut out at the shoulders. This protects the body and leaves the whole arm free for manipulation. Before inserting the arm it should be smeared with lard. This protects the skin against septic infection, and favors the introduction of the hand and arm. The hand should be inserted with the thumb and fingers drawn together like a cone. Whether standing or lying the mare should be turned with head down hill and hind parts raised as much as possible. The contents of the abdomen gravitating forward leave much more room for manipulation. Whatever part of the foal is presented (head, foot) should be secured with a cord and running noose before it is pushed back to search for the other missing parts. Even if a missing part is reached no attempt should be made to bring it up during a labor pain. Pinching the back will sometimes check the pains and allow the operator to secure and bring up the missing member. In intractable cases a large dose of chloral hydrate (1 ounce in a quart of water) or the inhalation of chloroform and air (equal proportions) to insensibility may secure a respite, during which the missing members may be replaced. If the *waters* have been discharged and the mucus dried up, the genital passages and body of the fœtus should be lubricated with lard or oil before any attempt at extraction is made. When the missing member has been brought up into position, and presentation has been rendered nat-

ural, traction on the fœ tus must be made only during a labor pain. If a mare is inclined to kick, it may be necessary to apply hobbles to protect the operator.

PREMATURE LABOR PAINS.

These may be brought on by any violent exertion, use under the saddle, or in heavy draught, or in rapid paces, or in travel by rail or sea, blows, kicks, crushing by other animals in a doorway or gate. Excessive action of purgative or diuretic agents, or of agents that irritate the bowels or kidneys, like arsenic, Paris green, all caustic salts and acids, and acrid and narcotico-acrid vegetables, is equally injurious. Finally, the ingestion of agents that stimulate the action of the gravid womb (ergot of rye or of other grasses, smut, various fungi of fodders, rue, savin, cotton-root, etc.) may bring on labor pains prematurely.

Besides the knowledge that parturition is not yet due, there will be less enlargement, redness and swelling of the vulva, less mucous discharge, less filling of the udder, and less appearances of wax and probably none of milk from the ends of the teats. The oiled hand introduced into the vulva will not enter with the ease usual at full term, and the neck of the womb will be felt not only closed, but with its projecting papillæ, through which it is perforated, not yet flattened down and effaced, as at full term. The symptoms are indeed those of threatened abortion, but at such an advanced stage of gestation as is compatible with the survival of the offspring.

The *treatment* consists in the separation of the mare from all other animals in a quiet, dark, secluded place, and the free use of anti-spasmodics and anodynes. Opium in dram doses every two hours, or laudanum in ounce doses at similar intervals, will often suffice. When the more urgent symptoms have subsided these doses may be repeated thrice a day till all excitement passes off or until the passages have become relaxed and prepared for parturition. Viburnum prunifolium, in ounce doses, may be added if necessary. Should parturition become inevitable, it may be favored and any necessary assistance furnished.

DIFFICULT PARTURITION FROM NARROW PELVIS.

A disproportion between the fœtus got by a large stallion and the pelvis of a small dam is a serious obstacle to parturition, sometimes seen in the mare. This is not the rule, however, as the foal up to birth usually accommodates itself to the size of the dam, as illustrated in the successful crossing of Percheron stallions on mustang mares. If the disproportion is too great the only resort is *embryotomy*.

FRACTURED HIP-BONES.

More commonly the obstruction comes from distortion and narrowing of the pelvis as the result of fractures. (Plates XIV, Fig. 2.) Fractures at any point of the lateral wall or floor of the pelvis are re-

paired with the formation of an extensive bony deposit bulging into the passage of the pelvis. The displacement of the ends of the broken bone is another cause of constriction and between the two conditions the passage of the fœtus may be rendered impossible without *embryotomy*. Fracture of the sacrum (the continuation of the back-bone forming the croup) leads to the depression of the posterior part of that bone in the roof of the pelvis and the narrowing of the passage from above downward by a bony ridge presenting its sharp edge forward.

In all cases in which there has been injury to the bones of the pelvis the obvious precaution is to withhold the mare from breeding and to use her for work only.

If a mare with a pelvis thus narrowed has got in foal inadvertently, abortion may be induced in the early months of gestation by slowly introducing the oiled finger through the neck of the womb and following this by the other fingers until the whole hand has been introduced. Then the water-bags may be broken, and with the escape of the liquid the womb will contract on the solid fœtus and labor pains will ensue. The fœtus being small it will pass easily.

TUMORS IN THE VAGINA AND PELVIS.

Tumors of various kinds may form in the vagina or elsewhere within the pelvis, and when large enough will obstruct or prevent the passage of the fœtus. Gray mares, which are so subject to black pigment tumors (*melanosis*) on the tail, anus, and vulva, are the most likely to suffer from this. Still more rarely the wall of the vagina becomes relaxed, and being pressed by a mass of intestines will protrude through the lips of the vulva as a hernial sac, containing a part of the bowels. Where a tumor is small it may only retard and not absolutely prevent parturition. A hernial protrusion of the wall of the vagina may be pressed back and emptied so that the body of the fœtus engaging in the passage may find no further obstacle. When a tumor is too large to allow delivery the only resort is to remove it, but before proceeding it must be clearly made out that the obstruction is a mass of diseased tissue, and not a sac containing intestines. If the tumor hangs by a neck it can usually be most safely removed by the *écraseur*, the chain being passed around the pedicel and gradually tightened until that is torn through.

HERNIA OF THE WOMB.

The rupture of the musculo-fibrous floor of the belly and the escape of the gravid womb into a sac formed by the peritoneum and skin hanging towards the ground, is described by all veterinary obstetricians, yet it is very rarely seen in the mare. The form of the fœtus can be felt through the walls of the sac, so that it is easy to recognize the condition. Its cause is usually external violence, though it may start from an umbilical hernia. When the period of parturition arrives, the first effort should be to return the fœtus within the proper abdominal cavity,

and this can sometimes be accomplished with the aid of a stout blanket gradually tightened around the belly. This failing, the mare may be placed on her side or back and gravitation brought to the aid of manipulation in securing the return. Even after the hernia has been reduced the relaxed state of the womb and abdominal walls may serve to hinder parturition, in which case the oiled hand must be introduced through the vagina, the fœtus brought into position, and traction coincident with the labor pains employed to secure delivery.

TWISTING OF THE NECK OF THE WOMB.

This condition is very uncommon in the mare, though occasionally seen in the cow, owing to the greater laxity of the broad ligaments of the womb in that animal. It consists in a revolution of the womb on its own axis, so that its right or left side will be turned upward (quarter revolution), or the lower surface may be turned upward and the upper surface downward (half revolution). The effect is to throw the narrow neck of the womb into a series of spiral folds, turning in the direction in which the womb has revolved, closing the neck and rendering distention and dilatation impossible.

The period and pains of parturition arrive, but in spite of continued efforts no progress is made, neither water-bags nor liquids appearing. The oiled hand introduced into the closed neck of the womb will readily detect the spiral direction of the folds on its inner surface.

The method of relief which I have successfully adopted in the cow may be equally happy in the mare. The dam is placed (with her head uphill) on her right side if the upper folds of the spiral turn toward the right, and on her left side if they turn toward the left; and the oiled hand is introduced through the neck of the womb and a limb or other part of the body of the fœtus is seized and pressed against the wall of the womb, while two or three assistants turn the animal over her back toward the other side. The object is to keep the womb stationary while the animal is rolling. If success attends the effort, the constriction around the arm is suddenly relaxed, the spiral folds are effaced, and the water-bags and fœtus press forward into the passage. If the first attempt does not succeed it may be repeated again and again until success crowns the effort. Among my occasional causes of failure have been the prior death and decomposition of the fœtus, with the extrication of gas and overdistention of the womb, and the supervention of inflammation and inflammatory exudation around the neck of the womb, which hinders untwisting. The first of these conditions occurs early in the horse from the detachment of the fœtal membranes from the wall of the womb, and as the mare is more subject to fatal peritonitis than the cow, it may be concluded that both these sources of failure are more probable in the equine subject.

When the case is intractable, though the hand may be easily introduced, the instrument shown in Plate VIII, Fig. 7, may be used.

Each hole at the small end of the instrument has passed through it a stout cord with a running noose, to be passed around two feet or other portion of the fœtus which it may be possible to reach. The cords are then drawn tight and fixed around the handle of the instrument, then by using the cross-handle as a lever the fœtus and womb may be rotated in a direction opposite to that causing the obstruction. During this process the hand must be introduced to feel when the twist has been undone. This method may be supplemented, if necessary, by rolling the mare as described above.

EFFUSION OF BLOOD IN THE VAGINAL WALLS.

This is common as a result of difficult parturition, but it may occur from local injury before that act, and may seriously interfere with it. This condition is easily recognized by the soft, doughy swelling so characteristic of blood clots, and by the dark red color of the mucous membrane. I have laid open such swellings with the knife as late as ten days before parturition, evacuated the clots, and dressed the wound daily with an astringent lotion (sulphate of zince 1 dram, carbolic acid 1 dram, water 1 quart). A similar resort might be had, if necessary, during parturition.

CALCULUS (STONE) AND TUMOR IN THE BLADDER.

The pressure upon the bladder containing a stone or a tumor may prove so painful that the mare will voluntarily suppress the labor pains. Examination of the bladder with the finger introduced through the urethra will detect the offending agent. A stone should be extracted with forceps (see "Lithotomy"). The large papillary tumors which I have met with in the mare's bladder have been invariably delicate in texture and could be removed piecemeal by forceps. Fortunately, mares affected in this way rarely breed.

IMPACTION OF THE RECTUM WITH FÆCES.

In some animals, with more or less paralysis or weakness of the tail and rectum, the rectum may become so impacted with solid fæces that the mare is unable to discharge them, and the accumulation both by reason of the mechanical obstruction and the pain caused by pressure upon it will impel the animal to cut short all labor pains. The rounded swelling surrounding the anus will at once suggest the condition, when the obstruction may be removed by the well-oiled or soaped hand.

SPASM OF THE NECK OF THE WOMB.

This occurs in the mare of specially excitable temperament, or under particular causes of irritation, local or general. Labor pains, though continuing for some time, produce no dilatation of the neck of the womb, which will be found firmly closed so as to admit but one or two fingers, and this, although the projection at the mouth of the womb

may have been entirely effaced, so that a simple round opening is left with rigid margins.

The simplest *treatment* consists in smearing this part with solid extract of belladonna, and after an interval inserting the hand with fingers and thumb drawn into the form of a cone, rupturing the membranes and bringing the fœtus into position for extraction, as advised under "Prolonged Retention of the Fœtus." Another mode is to insert through the neck of the womb an ovoid caoutchouc bag, empty, and furnished with an elastic tube 12 feet long. Carry the free end end of this tube upward to a height of 8, 10, or 12 feet, insert a filler into it, and proceed to distend the bag with tepid or warm water.

FIBROUS BANDS CONSTRICTING OR CROSSING THE NECK OF THE WOMB.

These occurring as the result of disease have been several times observed in the mare. They may exist in the cavity of the abdomen and compress and obstruct the neck of the womb, or they may extend from side to side of the vagina across and just behind the neck of the womb. In the latter position they may be felt and quickly remedied by cutting them across. In the abdomen they can only be reached by incision, and two alternatives are presented: (1) To perform embryotomy and extract the fœtus piecemeal; and (2) to make an incision into the abdomen and extract by the Cæsarian operation, or simply to cut the constricting band and attempt delivery by the usual channel.

FIBROUS CONSTRICTION OF VAGINA OR VULVA.

This is probably always the result of direct mechanical injury and the formation of rigid cicatrices which fail to dilate with the remainder of the passages at the approach of parturition. The presentation of the fœtus in the natural way and the occurrence of successive and active labor pains without any favorable result will direct attention to the rigid and unyielding cicatrices which may be incised at one, two, or more points to a depth of half an inch or more, after which the natural expulsive efforts will usually prove effective. The resulting wounds may be washed frequently with a solution of one part of carbolic acid to 50 parts of water, or of 1 part of mercuric chloride to to 500 parts water.

FŒTUS ADHERENT TO THE WALLS OF THE WOMB.

In inflammation of the mucous membrane lining the cavity of the womb and implicating the fœtal membranes, the resulting embryonic tissue sometimes establishes a medium of direct continuity between the womb and fœtal membranes; the blood vessels of the one communicate freely with those of the other and the fibers of the one are prolonged into the other. This causes retention of the membranes after birth, and a special risk of bleeding from the womb, and of septic poisoning. In exceptional cases the adhesion is more extensive

and binds a portion of the body of the foal firmly to the womb. In such cases it has repeatedly been found impossible to extract the foal until such adhesions were broken down. If they can be reached with the hand and recognized they may be torn through with the fingers or with a blunt hook, after which delivery may be attempted with hope of success.

EXCESSIVE SIZE OF THE FŒTUS.

It would seem that a small mare may usually be safely bred to a large stallion, yet this is not always the case, and when the small size is an individual rather than a racial characteristic or the result of extreme youth, the rule can not be expected to hold. There is always great danger in breeding the young, small, and undeveloped female, and the dwarfed representative of a larger breed, as the offspring tend to partake of the large race characteristics and to show them even prior to birth. When impregnation has occurred in the very young or in the dwarfed female, there are two alternatives—to induce abortion, or to wait until there are attempts at parturition and to extract by embryotomy if impracticable otherwise.

CONSTRICTION OF A MEMBER BY THE NAVEL STRING.

In man and animals alike the winding of the umbilical cord round a member of the fœtus sometimes leads to the amputation of the latter. It is also known to get wound around the neck or a limb at birth, but in the mare this does not seriously impede parturition, as the loosely attached membranes are easily separated from the womb and no strangulation or retarding occurs. The foal may, however, die from the cessation of the placental circulation unless it is speedily delivered.

WATER IN THE HEAD (HYDROCEPHALUS) OF THE FOAL.

This consists in the excessive accumulation of liquid in the ventricles of the brain so that the cranial cavity is enlarged and constitutes a great projecting rounded mass occupying the space from the eyes upward. (See Plate XIV, Fig. 3.) With an anterior presentation (fore feet and nose) this presents an insuperable obstacle to progress, as the diseased cranium is too large to enter the pelvis at the same time with the fore-arms. With a posterior presentation (hind feet) all goes well until the body and shoulders have passed out, when progress is suddenly arrested by the great bulk of the head. In the first case, the oiled hand introduced along the face detects the enormous size of the head, which may be diminished by puncturing it with a knife or trochar and cannula in the median line, evacuating the water and pressing in the thin bony walls. With a posterior presentation, the same course must be followed; the hand passed along the neck will detect the cranial swelling, which may be punctured with a knife or trochar. Oftentimes with an anterior presentation the great size of the head leads to its

displacement backward and thus the fore limbs alone engage in the passages. Here the first object is to seek and bring up the missing head, and then puncture it as above suggested.

DROPSY OF THE ABDOMEN IN THE FOAL—ASCITES.

The accumulation of liquid in the abdominal cavity of the fœtus is less frequent, but when present it may arrest parturition as completely as will hydrocephalus. With an anterior presentation the foal may pass as far as the shoulders, but behind this all efforts fail to secure a further advance. With a posterior presentation the hind legs as far as the thighs may be expelled, but at this point all progress ceases. In either case the oiled hand passed inward by the side of the foal will detect the enormous distention of the abdomen and its soft, fluctuating contents. The only course is to puncture the cavity and evacuate the liquid. With the anterior presentation this may be done with a long trochar and cannula, introduced through the chest and diaphragm; or with a knife an incision may be made between the first two ribs, and the lungs and heart cut or torn out, when the diaphragm will be felt projecting strongly forward and may be easily punctured. Should there not be room to introduce the hand through the chest, the oiled hand may be passed along beneath the breast bone and the abdomen punctured. With a posterior presentation the abdomen must be punctured in the same way, the hand, armed with a knife protected in its palm, being passed along the side of the flank or between the hind limbs. It should be added that moderate dropsy of the abdomen is not incompatible with natural delivery, the liquid being at first crowded back into the portion of the belly still engaged in the womb, and passing slowly from that into the advanced portion as soon as that has cleared the narrow passage of the pelvis, and passed out where it can expand.

GENERAL DROPSY OF THE FŒTUS.

In this case the tissues generally are distended with liquid, and the skin is found at all points tense and rounded, and pitting on pressure with the fingers. In some such cases delivery may be effected after the skin has been punctured at narrow intervals to allow the escape of the fluid and then liberally smeared with fresh lard. More commonly, however, it can not be reached at all points to be so punctured, nor sufficiently reduced to be extracted whole, and resort must be had to *embryotomy*.

SWELLING OF THE FŒTUS WITH GAS—EMPHYSEMA.

This has been described as occurring in a living fœtus, but I have only met with it in the dead and decomposing foal, after futile efforts have been made for several days to effect delivery. These cases are very difficult ones, as the foal is inflated to such an extent that it is impossible to advance it into the passages, and the skin of the fœtus

and the walls of the womb and vagina have become so dry that it is impracticable to cause the one to glide on the other. The hair comes off any part that may be seized, and the case is rendered the more offensive and dangerous by the very fetid liquids and gases. The only resort is *embryotomy*, by which I have succeeded in saving a valuable mare that had carried a colt in this condition for four days.

CONTRACTIONS OF MUSCLES.

The foal is not always developed symmetrically, but certain groups of muscles are liable to remain short or to shorten because of persistent spasmodic contraction, so that even the bones become distorted and twisted. This is most common in the neck. The bones of this part and even of the face are drawn to one side and shortened, the head being held firmly to the flank and the jaws being twisted to the right or left. In other cases the flexor muscles of the fore limbs are contracted so that these members are strongly bent at the knee. In neither of these cases can the distorted part be extended and straightened, so that body or limbs must necessarily present double, and natural delivery is rendered impossible. The bent neck may sometimes be straightened after the muscles have been cut on the side to which it is turned, and the bent limbs after the tendons on the back of the shank bone have been cut across. Failing to accomplish this, the next resort is to *embryotomy*.

TUMORS OF THE FŒTUS—INCLOSED OVUM.

Tumors or diseased growths may form on any part of the foal, internal or external, and by their size impede or hinder parturition. In some cases what appears as a tumor is an imprisoned and undeveloped ovum, which has grafted itself on the fœtus. These are usually sacculated and may contain skin, hair, muscle, bone, and other natural tissues. The only course to be pursued in such cases is to excise the tumor, or, if this is not feasible, to perform *embryotomy*.

MONSTROSITIES.

Monstrosity in the foal is an occasional cause of difficult parturition, especially such monsters as show excessive development of some part of the body, a displacement or distortion of parts, or a redundancy of parts, as in double monsters. Monsters may be divided into—

(1) Monsters with absence of parts—absence of head, limb, or other organ.

(2) Monsters with some part abnormally small—dwarfed head, limb, trunk, etc.

(3) Monsters through unnatural division of parts—cleft head, trunk, limbs, etc.

(4) Monsters through absence of natural divisions—absence of mouth, nose, eyes, anus, confluent digits, etc.

(5) Monsters through fusion of parts—one central eye, one nasal opening, etc.

(6) Monsters through abnormal position or form of parts—curved spine, face, limb, etc.

(7) Monsters through excess of formation—enormous head, super numerary digits, etc.

(8) Monsters through imperfect differentiation of sexual organs—hermaphrodites.

(9) Double monsters—double-headed, double-bodied, extra limbs, etc.

The *causes* of monstrosities appear to be very varied. Some monstrosities, like extra digits, absence of horns or tails, etc., run in families and are produced almost as certainly as color or form. Others are associated with too close breeding, the powers of symmetrical development being interfered with, just as in other cases a sexual incompatibility is developed, near relatives failing to breed with each other. Mere arrest of development of a part may arise from accidental disease of the embryo; hence vital organs are left out, or portions of organs, like the dividing walls of the heart, are omitted. Sometimes an older fœtus is inclosed in the body of another, each having started independently from a separate ovum, but the one having become embedded in the semi-fluid mass of the other and having developed there simultaneously with it, but not so largely nor perfectly. In many cases of redundance of parts, the extra part or member has manifestly developed from the same ovum and nutrient center with the normal member to which it remains adherent, just as a new tail will grow out in a newt when the the former has been cut off. In the early embryo, with its great powers of development, this factor can operate to far greater purpose than in the adult animal. Its influence is seen in the fact pointed out by St. Hilaire that such redundant parts are nearly always connected with the corresponding portions in the normal fœtus. Thus superfluous legs or digits are attached to the normal ones, double heads or tails are connected to a common neck or rump, and double bodies are attached to each other by corresponding points, navel to navel, breast to breast, back to back. All this suggests the development of extra parts from the same primary layer of the impregnated and developing ovum. The effect of disturbing conditions in giving such wrong directions to the developmental forces is well shown in the experiments of St. Hilaire and Valentine in varnishing, shaking, and otherwise breaking up the natural connections in eggs, and thereby determining the formation of monstrosities at will. So, in the mammal, blows and other injuries that detach the fœtal membranes from the walls of the womb or that modify their circulation by inducing inflammation are at times followed by the development of a monster. The excitement, mental and physical, attendant on fright occasionally acts in a similar way, acting probably through the same channels.

The monstrous forms likely to interfere with parturition are such as from contracted or twisted limbs or spine, must be presented double; where supernumerary limbs, head, or body must approach the passages with the natural ones; where a head or other member has attained to an unnatural size; where the body of one fœtus has become inclosed in or attached to another, etc.

Extraction is sometimes possible by straightening the members and securing such a presentation as will reduce the presenting mass to its smallest and most wedge-like dimensions. To effect this it may be needful to cut the flexor tendons of bent limbs or the muscles on the side of a twisted neck or body; and one or more of the manipulations necessary to secure and bring up a missing member may be required. In most cases of monstrosity by excess, however, it is needful to remove the superfluous parts, in which case the general principles employed for *embryotomy* must be followed. The Cæsarian section, by which the fœtus is extracted through an incision in the walls of the abdomen and womb, is inadmissible, as it practically entails the sacrifice of the mare, which should never be done for the sake of a monster. See "Embryotomy."

ENTRANCE OF TWINS INTO THE PASSAGE AT ONCE.

Twins are rare in the mare, and still more rare is the impaction of both at once into the pelvis. The condition would be easily recognized by the fact that two fore limbs and two hind would occupy the passage at once, the front of the hoofs of the fore feet being turned upward and those of the hind feet downward. If both belonged to one foal they would be turned in the same direction. Once recognized, the condition is easily remedied by passing a rope with a running noose round each foot of the foal that is farthest advanced or that promises to be most easily extracted; and to push the members of the other fœtus back into the depth of the womb. As soon as the one fœtus is fully engaged in the passage it will hold its place and its delivery will proceed in the natural way.

TABLE OF WRONG PRESENTATIONS.

Anterior presentations.	Fore limbs	Incompletely extended. Flexor tendons shortened.
		Crossed over the neck.
		Bent back at the knee.
		Bent back from the shoulder.
	Head	Bent downward on the neck.
		Head and neck turned back beneath the breast.
		Turned to one side.
		Turned upward and backward on the back.
	Hind limbs	Hind feet engaged in the pelvis.
	Transverse	Back of foal to side of pelvis.
	Inverted	Back of foal to floor of pelvis.
Posterior presentations.	Hind limbs	Bent on itself at the hock.
		Bent at the hip.
	Transverse	Back of foal to side of pelvis.
	Inverted	Back of foal to floor of pelvis.
Transverse presentation of body.		With back and loins presented.
		With breast and belly presented.

FORE-LIMBS INCOMPLETELY EXTENDED.

In cases of this kind, not only are the back tendons behind the knee and shank-bone unduly short, but the sinew extending from the front of the shoulder-blade over the front of the elbow and down to the head of the shank-bone is also shortened. The result is that the fore-limb is bent at the knee and the elbow is also rigidly bent. The condition obstructs parturition by the feet becoming pressed against the floor of the pelvis or by the elbow pressing on its anterior brim. Relief is to be obtained by forcible extension. A rope with a running noose is passed around each fetlock and a repeller (see Plate VIII), planted in the breast is pressed in a direction upward and backward while active traction is made on the ropes. If the feet are not thereby raised from the floor of the pelvis the palm of the hand may be placed beneath them to protect the mucous membrane until they have advanced sufficiently to obviate this danger. In the absence of a repeller, a smooth rounded fork-handle may be employed. If the shortening is too great to allow of the extension of the limbs in this way, the tense tendons may be cut across behind the shank bone and in front of the elbow, and the limb will be easily straightened out. This is most easily done with an embryotomy knife furnished with a ring for the middle finger, so that the blade may be protected in the palm of the hand. (See Plate XIV, Fig. 4.)

ONE FORE-LIMB CROSSED OVER THE BACK OF THE NECK.

With the long fore-limbs of the foal this readily occurs and the resulting increase in thickness, both at the head and shoulder, offers a serious obstacle to progress. (See Plate X, Fig. 2.) The hand introduced into the passage detects the head and one forefoot, and further back on the same side of the head the second foot, from which the limb may be traced obliquely across the back of the neck.

If parturition continues to make progress the displaced foot may bruise and lacerate the vagina. By seizing the limb above the fetlock it may be easily pushed over the head to the proper side, when parturition will proceed normally.

FORE-LIMB BENT AT THE KNEE.

The nose and one fore-foot present, and on examination the knee of the missing fore-limb is found farther back. (Plate X, Fig. 1.) First place a noose each on the presenting pastern and lower jaw, and push back the body of the fœtus with a repeller, while the operator seizing the shank of the bent limb extends it so as to press back the knee and bring forward the fetlock and foot. As progress is made little by little the hand is slid down from the region of the knee to the fetlock, and finally that is secured and brought up into the passage, when parturition will proceed without hindrance. If both fore-limbs

are bent back the head must be noosed and the limbs brought up as above, one after the other. It is usually best to employ the left hand for the right fore-limb and the right hand for the left fore-limb.

FORE-LIMB TURNED BACK FROM THE SHOULDER.

In this case, on exploration by the side of the head and presenting limb, the shoulder only can be reached at first. (Plate X, Fig. 4.) By noosing the head and presenting fore-limb these may be drawn forward into the pelvis, and the oiled hand being carried along the shoulder in the direction of the missing limb is enabled to reach and seize the fore arm just below the elbow. The body is now pushed back by the assistants pressing on the head and presenting limb or on a repeller planted in the breast until the knee can be brought up into the pelvis, after which the procedure is the same as described in the last paragraph.

HEAD BENT DOWN BETWEEN THE FORE-LIMBS.

This may be so that the poll or nape of the neck with the ears can be felt far back between the fore-limbs, or so that only the upper border of the neck can be reached, head and neck being bent back beneath the body. With the head only bent on the neck, noose the two presenting limbs, then introduce the hand between them until the nose can be seized in the palm of the hand. Next have the assistants push back the presenting limbs, while the nose is strongly lifted upward over the brim of the pelvis. This accomplished it assumes the natural position and parturition is easy.

When both head and neck are bent downward it may be impossible to reach the nose. If, however, the labor has only commenced, the limbs may be drawn upon until the operator can reach the ear, by dragging on which the head may be so far advanced that the fingers may reach the orbit; traction upon this while the limbs are being pushed back may bring the head up so that it bends on the neck only, and the further procedure will be as described in the last paragraph.

If the labor has been long in progress and the fœtus is jammed into the pelvis, the womb emptied of the waters and firmly contracted on its solid contents, the case is incomparably more difficult. The mare may be chloroformed and turned on her back with hind parts elevated, and the womb may be injected with sweet-oil. Then, if the ear can be reached, the correction of the mal-presentation may be attempted as above described. Should this fail one or more sharp hooks may be inserted in the neck as near the head as can be reached, and ropes attached to these may be dragged on, while the body of the foal is pushed back by the fore-limbs or by a repeller. Such repulsion should be made in a direction obliquely upward toward the loins of the mother so as to rotate the fœtus in such a way as to bring the head up. As this is accomplished a hold should be secured nearer and nearer to the nose, with hand or hook, until the head can be straightened out on the neck.

All means failing, it becomes necessary to remove the fore-limbs (*embryotomy*) so as to make more space for bringing up the head. If, even then, this can not be accomplished, it may be possible to push the body backward and upward with the repeller until the hind-limbs are brought to the passage, when they may be noosed and delivery effected with the posterior presentation.

HEAD TURNED BACK ON THE SHOULDER.

In this case, the fore-feet present, and the oiled hand passed along the fore-arms in search of the missing head finds the side of the neck turned to one side, the head being perhaps entirely out of reach. (Plate XIII, Fig. 1.) To bring forward the head it may be desirable to lay the mare on the opposite side to that to which the head is turned, and even to give chloroform or ether. Then the feet being noosed, the body of the fœtus is pushed by the hand or repeller forward and to the side opposite to that occupied by the head until the head comes within reach, near the entrance of the pelvis. If such displacement of the fœtus is difficult, it may be facilitated by a free use of oil or lard. When the nose can be seized it can be brought into the passage as when the head is turned down. If it can not be reached the orbit may be availed of to draw the head forward until the nose can be seized or the lower jaw noosed. In very difficult cases a rope may be passed around the neck by the hand, or with the aid of a curved carrier (Plate VIII), and traction may be made upon this while the body is being rotated to the other side. In the same way, in bad cases, a hook may be fixed in the orbit or even between the bones of the lower jaw to assist in bringing the head up into position. Should all fail, the amputation of the fore-limbs may be resorted to as advised under the last heading.

HEAD TURNED UPWARD ON THE BACK.

This differs from the last mal-presentation only in the direction of the head, which has to be sought above rather than at one side, and is to be secured and brought forward in a similar manner. (Plate XIII, Fig. 2.) If a rope can be passed around the neck it will prove most effectual, as it naturally slides nearer to the head as the neck is straightened, and ends by bringing the head within easy reach.

HIND FEET ENGAGED IN THE PELVIS.

In this case fore-limbs and head present naturally, but the hind limbs bent forward from the hip and the loins arched allow the hind feet also to enter the passages, and the farther labor advances the more firmly does the body of the foal become wedged into the pelvis. (Plate XII, Fig. 2.) The condition is to be recognized by introducing the oiled hand along the belly of the fœtus, when the hind feet will be

felt advancing. An attempt should at once be made to push them back, one after the other, over the brim of the pelvis. Failing in this, the mare may be turned on her back, head down hill, and the attempt renewed. If it is possible to introduce a straight rope carrier, a noose passed through this may be put on the fetlock and the repulsion thereby made more effective. In case of continued failure the anterior presenting part of the body may be skinned and cut off as far back toward the pelvis as possible (see "Embryotomy"); then nooses are placed on the hind fetlocks and traction is made upon these while the quarters are pushed back into the womb. Then the remaining portion is brought away by the posterior presentation.

ANTERIOR PRESENTATION WITH BACK TURNED TO ONE SIDE.

The greatest diameter of the axis of the foal, like that of the pelvic passages, is from above downward, and when the fœtus enters the pelvis with this greatest diameter engaged transversely or in the narrow diameter of the pelvis, parturition is rendered difficult or impossible. In such a case the pasterns and head may be noosed, and the passages and engaged portion of the foal freely lubricated with lard, the limbs may be crossed over each other and the head, and a movement of rotation effected in the fœtus until its face and back are turned up toward the croup of the mother; then parturition becomes natural.

BACK OF THE FOAL TURNED TO THE FLOOR OF THE PELVIS.

In a roomy mare this is not an insuperable obstacle to parturition, yet it may seriously impede it, by reason of the curvature of the body of the foal being opposite to that of the passages, and the head and withers being liable to arrest against the border of the pelvis. Lubrication of the passage with lard and traction of the limbs and head will usually suffice with or without the turning of the mare on her back. In obstinate cases two other resorts are open: (1) to turn the foal, pushing back the fore-parts and bringing up the hind so as to make a a posterior presentation, and (2) the amputation of the fore-limbs, after which extraction will usually be easy.

HIND PRESENTATION WITH LEG BENT AT HOCK.

In this form the quarters of the foal with the hind-legs bent up beneath them present, but can not advance through the pelvis by reason of their bulk. (Plate X, Fig. 3.) The oiled hand introduced can recognize the outline of the buttocks, with the tail and anus in the center and the sharp points of the hocks beneath. First pass a rope around each limb at the hock, then with hand or repeller, push the buttocks backward and upwards, until the feet can be brought up into the passages. The great length of the shank and pastern in the foal is a serious obstacle to this, and in all cases the foot should be protected in the

palm of the hand while being brought up over the brim of the pelvis. Otherwise the womb may be torn. When the pains are too violent and constant to allow effective manipulation, some respite may be obtained by the use of chloroform or morphia, and by turning the mare on her back, but too often the operator fails and the foal must be sacrificed. Two courses are still open: first, to cut through the cords behind and above the hock and extend the upper part of the limb, leaving the hock bent, and extract in this way, and, second, to amputate the hind limbs at the hip joint and remove them separately, after which the body may be extracted.

HIND PRESENTATION WITH LEGS BENT FORWARD FROM THE HIP.

This is merely an aggravated form of the presentation last described. (Plate XII, Fig. 1). If the mare is roomy a rope may be passed around each thigh and the body pushed upward and forward, so as to bring the hocks and heels upward. If this can be accomplished, nooses are placed on the limb farther and farther down until the feltlock is reached and brought into position. If failure is met with, then amputation at the hips is the *dernier ressort*.

HIND PRESENTATIONS WITH THE BACK TURNED SIDEWAYS OR DOWNWARD.

These are the counterparts of similar anterior presentations and are to be managed in the same way.

PRESENTATION OF THE BACK.

This is rare, yet not unknown, the foal being bent upon itself with the back, recognizable by its sharp row of spines, presented at the entrance of the pelvis, and the head and all four feet turned back into the womb. (Plate XI, Fig. 1.) The body of the fœtus may be extended across the opening transversely so that the head corresponds to one side (right or left), or it may be vertical with the head above or below.

In any such position the object should be to push the body of the fœtus forward and upward or to one side, as may best promise to bring up the fore or hind extremities, and bring the latter into the passage so as to constitute a normal anterior or posterior presentation. This turning of the fœtus may be favored by a given position of the mother, by the free use of oil or lard on the surface of the fœtus, and by the use of a propeller.

PRESENTATION OF BREAST AND ABDOMEN.

This is the reverse of the back presentation, the foal being extended across in front of the pelvic opening, but with the belly turned toward the passages and with all four feet engaged in the passage. (Plate XI, Fig. 2.) The most promising course is to secure the hind feet with

nooses and then push the forefeet forward into the womb. As soon as the forefeet are pushed forward clear of the brim of the pelvis, traction is made on the hind feet so as to bring the thighs into the passage and prevent the re-entrance of the fore-limbs. If it prove difficult to push back the fore-limbs a noose may be passed around the fetlock of each and the cord drawn through the eye of a rope carrier, by means of which the members may be easily pushed back.

EMBRYOTOMY.

This consists in the dissection of the fœtus so as to reduce its bulk and allow of its exit through the pelvis. The indications for its adoption have been furnished in the foregoing pages. The operation will vary in different cases according to the necessity for the removal of one or more parts in order to secure the requisite reduction in size. Thus it may be needful to remove head and neck, one fore-limb or both, one hind limb or both, to remove different parts of the trunk, or to remove superfluous (monstrous) parts. Some of the simplest operations of embryotomy (incision of the head in hydrocephalus, incision of the belly in dropsy) have already been described. It remains to notice the more difficult procedures which can be best undertaken by the skilled anatomist.

Amputation of the fore limbs.—This may usually be begun on the fetlock of the limb projecting from the vulva. An embryotomy knife is desirable. This knife consists of a blade with a sharp, slightly hooked point, and one or two rings in the back of the blade large enough to fit on the middle finger, while the blade is protected in the palm of the hand. (See Plate XIV, Fig. 4.) Another form has the blade inserted in a mortise in the handle from which it is pushed out by a movable button when wanted. First place a noose around the fetlock of the limb to be amputated, cut the skin circularly entirely around the fetlock, then make an incision on the inner side of the limb from the fetlock up to the breast bone. Next dissect the skin from the limb, from the fetlock up to the breast bone on the inner side, and as far up on the shoulder blade as possible on the outer side. Finally, cut through the muscles attaching the limb to the breast bone, and employ strong traction on the limb so as to drag out the whole limb, shoulder blade included. The muscles around the upper part of the shoulder blade are easily torn through and need not be cut, even if that were possible. In no case should the fore-limb be removed unless the shoulder blade is taken with it, as that furnishes the greatest obstruction to delivery, above all when it is no longer advanced by the extension of the fore-limb, but is pressed back so as to increase the already thickest posterior portion of the chest. The preservation of the skin from the whole limb is advantageous in various ways; it is easier to cut it circularly at the fetlock than at the shoulder; it covers the hand and knife in making the needful incisions, thus acting as a protection to the womb; and it affords a

means of traction on the body after the limb has been removed. In dissecting the skin from the limb the knife is not needful at all points; much of it may be stripped off with the fingers or knuckles, or by a blunt iron spud pushed up inside the hide, which is meanwhile held tense to render the spud effective.

Amputation of the head.—This is easy when both fore-limbs are turned back and the head alone has made its exit in part. It is more difficult when the head is still retained in the passages or womb, as in double-headed monsters. The head is secured by a hook in the lower jaw, or in the orbit, or by a halter, and the skin is divided circularly around the lower part of the face or at the front of the ears, according to the amount of head protruding. Then an incision is made backward along the line of the throat, and the skin dissected from the neck as far back as possible. Then the muscles and other soft parts of the neck are cut across, and the bodies of two vertebræ (neck bones) are severed by cutting completely across the cartilage of the joint. The bulging of the ends of the bones will serve to indicate the seat of the joint. The head and detached portion of the neck may now be removed by steady pulling. If there is still an obstacle the knife may be again used to sever any obstinate connections. In the case of a double-headed monster, the whole of the second neck must be removed with the head. When the head has been detached a rope should be passed through the eye-holes, or through an artificial opening in the skin, and tied firmly around the skin, to be employed as a means of traction when the missing limbs or the second head have been brought up into position.

Amputation of the hind limb.—This may be required when there are extra hind limbs, or when the hind limbs are bent forward at hock or hip joint. In the former condition the procedure resembles that for removal of a fore-limb, but requires more anatomical knowledge. Having noosed the pastern, a circular incision is made through the skin around the fetlock, and a longitudinal one from that up to the groin, and the skin is dissected from the limb as high up as can be reached, over the croup if possible. Then cut through the muscles around the hip joint, and, if possible, the two interarticular ligaments of the joint (pubio-femoral and round), and extract the limb by strong dragging.

In case the limb is bent forward at the hock, a rope is passed round that and pulled so as to bring the point of the hock between the lips of the vulva. The hamstring and the lateral ligaments of the hock are now cut through, and the limbs extended by a rope tied round the lower end of the long bone above (tibia). In case it is still needful to remove the upper part of the limb, the further procedure is the same as described in the last paragraph.

In case the limb is turned forward from the hip, and the fœtus so wedged into the passage that turning is impossible, the case is very difficult. I have repeatedly succeeded by cutting in on the hip joint and disarticulating it, then dissecting the muscles back from the upper

end of the thigh bone. A noose was placed around the neck of the bone and pulled on forcibly, while any unduly resisting structures were cut with the knife.

Cartwright recommends to make free incisions round the hip joints and tear through the muscles when they can not be cut; then with cords round the pelvic bones, and hooks inserted in the openings in the floor of the pelvis to drag out the pelvic bones; then put cords around the heads of the thigh bones and extract them; then remove the intestines; and finally, by means of the loose, detached skin, draw out the body with the remainder of the hind limbs bent forward beneath it.

Reuff cuts his way into the pelvis of the foal, and with a knife separates the pelvic bones from the loins, then skinning the quarter draws out these pelvic bones by means of ropes and hooks, and along with them the hind limbs.

The hind limbs having been removed by one or the other of these procedures, the loose skin detached from the pelvis is used as a means of traction and delivery is effected. If it has been a monstrosity with extra hind limbs, it may be possible to bring these up into the passage and utilize them for traction.

Removal of the abdominal viscera.—In case where the belly is unduly large, from decomposition, tumors, or otherwise, it may be needful to lay it open with the knife and cut or tear out the contents.

Removal of the thoracic viscera.—To diminish the bulk of the chest it has been found advisable to cut out the breast-bone, remove the heart and lungs, and allow the ribs to collapse with the lower free ends overlapping each other.

Dissection of the trunk.—In case it becomes necessary to remove other portions of the trunk, the general rule should be followed of preserving the skin so that all manipulations can be made inside this as a protector, that it may remain available as a means of exercising traction on the remaining parts of the body, and as a covering to protect the vaginal walls against injuries from bones while such part is passing.

FLOODING—BLEEDING FROM THE WOMB.

This is rare in the mare, but not unknown, in connection with a failure of the womb to contract on itself after parturition, or with eversion of the womb (casting the withers), and congestion or laceration. If the blood accumulates in the flaccid womb the condition may only be suspected by reason of the rapidly advancing weakness, swaying, unsteady gait, hanging head, paleness of the eyes and other mucous membranes, and weak, small, failing pulse. The hand introduced into the womb detects the presence of the blood partly clotted. If the blood escapes by the vulva the condition is evident.

Treatment consists in evacuating the womb of its blood clots, giving a large dose of powdered ergot of rye, and in the application of cold water or ice to the loins and external generative organs. Beside this

a sponge impregnated with a strong solution of alum, or, still better, with tincture of muriate of iron may be introduced into the womb and squeezed so as to bring the liquid in contact with the walls generally.

EVERSION OF THE WOMB.

If the womb fails to contract after difficult parturition, the after-pains will sometimes lead to the fundus passing into the body of the organ and passing through that and the vagina until the whole inverted organ appears externally and hangs down on the thighs. The result is rapid engorgement and swelling of the organ, impaction of the rectum with fæces, and distention of the bladder with urine, all of which conditions seriously interfere with the return of the mass. In returning the womb the standing is preferable to the recumbent position, as the abdomen is more pendant and there is less obstruction to the return. It may, however, be necessary to put hobbles on the hind limbs to prevent the mare from kicking. A clean sheet should be held beneath the womb and all filth, straw, and foreign bodies washed from its surface. Then with a broad, elastic (india-rubber) band, or in default of that a long strip of calico 4 or 5 inches wide, wind the womb as tightly as possible, beginning at its most dependent part (the extremity of the horn). This serves two good ends. It squeezes out into the general circulation the enormous mass of blood which engorged and enlarged the organ, and it furnishes a strong protective covering for the now delicate friable organ, through which it may be safely manipulated without danger of laceration. The next step may be the pressure on the general mass while those portions next the vulva are gradually pushed in with the hands; or the extreme lowest point (the end of the horn) may be turned within itself and pushed forward into the vagina by the closed fist, the return being assisted by manipulations by the other hand, and even by those of assistants. By either mode the manipulations may be made with almost perfect safety so long as the organ is closely wrapped in the bandage. Once a portion has been introduced into the vagina the rest will usually follow with increasing ease, and the operation should be completed with the hand and arm extended the full length within the womb and moved from point to point so as to straighten out all parts of the organ and insure that no portion still remains inverted within another portion. Should any such partial inversion be left it will give rise to straining, under the force of which it will gradually increase until the whole mass will be protruded as before. The next step is to apply a truss as an effectual mechanical barrier to further escape of the womb through the vulva. The simplest is made with two inch ropes, each about 18 feet long. These are each doubled and interwoven at the bend, as seen in Plate VIII, Fig. 4. The ring formed by the interlacing of the two ropes is adjusted around the vulva, the two ends of the one rope are carried up on the right and left of the tail and along the spine, being wound round each other in their course, and are finally

tied to the upper part of the collar encircling the neck. The remaining two ends, belonging to the other rope, are carried downward and forward between the thighs and thence forward and upward on the sides of the belly and chest to be attached to the right and left sides of the collar. These ropes are drawn tightly enough to keep closely applied to the opening without chafing, and will fit still more securely when the mare raises her back to strain. It is desirable to tie the mare short so that she may be unable to lie down for a day or two, and she should be kept in a stall with the hind parts higher than the fore. Violent straining may be checked by full doses of opium (one-half dram), and any costiveness or diarrhea should be obviated by a suitable laxative or binding diet.

In some mares the contractions are too violent to allow of the return of the womb, and full doses of opium (one-half dram), laudanum (two ounces), or chloral hydrate (one ounce) may be demanded, or the mare must be rendered insensible by ether or chloroform.

RUPTURE OR LACERATION OF THE WOMB.

This may occur from the feet of the foal during parturition, or from ill-directed efforts to assist, but it is especially liable to take place in the everted, congested, and friable organ. The resultant dangers are bleeding from the wound, escape of the bowels through the opening and their fatal injury by the mare's feet or otherwise, and peritonitis from the extension of inflammation from the wound and from the poisonous action of the septic liquids of the womb escaping into the abdominal cavity. The first object is to close the wound, but unless in eversion of the womb this is practically impossible. In the last named condition the wound must be carefully and accurately sewed up before the womb is returned. After its return, the womb must be injected daily with an antiseptic solution (borax one-half ounce or carbolic acid 3 drachms to a quart of tepid water). If inflammation threatens, the abdomen may be bathed continuously with hot water by means of a heavy woolen rag, and large doses of opium (one-half dram) may be given twice or thrice daily.

RUPTURES OF THE VAGINA.

These are attended by dangers similar to those belonging to rupture of the womb, and in addition by the risk of protrusion of the bladder, which appears through the lips of the vulva as a red pyriform mass. Sometimes such lacerations extend downward into the bladder, and in others upward into the terminal gut (rectum). In still other cases the anus is torn so that it forms one common orifice with the vulva.

Too often such cases prove fatal, or at least a recovery is not attained, and urine or fœces or both escape freely into the vagina. The

simple laceration of the anus is easily sewed up, but the ends of the muscular fibers do not reunite and the control over the lower bowel is never fully re-acquired. The successful stitching up of the wound communicating with the bladder or the rectum requires unusual skill and care, and though I have succeeded in a case of the latter kind, I can not advise the attempt by unprofessional persons.

BLOOD CLOTS IN THE WALLS OF THE VAGINA.

See "Obstructions to parturition."

INFLAMMATION OF THE WOMB AND PERITONEUM.

These may result from injuries sustained by the womb during or after parturition, from exposure to cold or wet, or from the irritant action of putrid products within the womb. Under the inflammation the womb remains dilated and flaccid, and decomposition of its secretions almost always occurs, so that the inflammation tends to assume a putrid character and general septic infection is likely to occur.

The *symptoms* are ushered in by shivering, staring coat, small rapid pulse, elevated temperature, accelerated breathing, inappetence, with arched back, stiff movement of the body, looking back at the flanks, and uneasy motions of the hind limbs, discharge from the vulva of a liquid at first watery, reddish, or yellowish, and later it may be whitish or glairy, and fetid or not in different cases. Tenderness of the abdomen shown on pressure is especially characteristic of cases affecting the peritoneum or lining of the belly, and is more marked lower down. If the animal survives, the inflammation tends to become chronic and attended by a whitish muco-purulent discharge. If, on the contrary, it proves fatal, death is preceded by extreme prostration and weakness from the general septic poisoning.

In *treatment* the first thing to be sought is the removal of all offensive and irritant matters from the womb through a caoutchouc tube introduced into the womb, and into which a funnel is fitted. Warm water should be passed until it comes away clear. To insure that all of the womb has been washed out, the oiled hand may be introduced to carry the end of the tube into the two horns successively. When the offensive contents have been thus removed, the womb should be injected with a quart of water holding in solution one-half ounce permanganate of potash, or, in the absence of the latter, two teaspoonfuls of carbolic acid. Repeat twice daily. Fomentation of the abdomen, or the application of a warm flax-seed poultice, may greatly relieve. Acetanilid, in doses of half an ounce, repeated twice or thrice a day, or sulphate of quinia in doses of one-third ounce, may be employed to reduce the fever. If the great prostration indicates septic poisoning large doses (one-half ounce) bisulphite of soda, or salicylate of soda may be resorted to.

LEUCORRHŒA.

This is a white, glutinous, chronic discharge, the result of a continued sub-acute inflammation of the mucous membrane of the womb. Like the discharge of acute inflammation it contains many forms of bacteria, by some of which it is manifestly inoculable on the penis of the stallion, producing ulcers and a specific gonorrhœal discharge.

Treatment may consist in the internal use of tonics (sulphate of iron 3 drams daily), and the washing out of the womb, as described under the last heading, followed by an astringent antiseptic injection (carbolic acid 2 teaspoonfuls, tannic acid one-half dram, water one quart). This may be repeated two or three times a day.

LAMINITIS OR FOUNDER FOLLOWING PARTURITION.

This sometimes follows on inflammation of the womb, as it frequently does on disorder of the stomach. Its symptoms agree with those of the common form of founder, and treatment need not differ.

DISEASES OF THE UDDER AND TEATS—CONGESTION AND INFLAMMATION OF THE UDDER.

This is comparatively rare in the mare, though in some cases the udder becomes painfully engorged before parturition, and a doughy swelling, pitting on pressure, extends forward on the lower surface of the abdomen. When this goes on to active inflammation one or both of the glands become enlarged, hot, tense, and painful; the milk is dried up or replaced by a watery or reddish serous fluid, which at times becomes fetid; the animal walks lame, loses appetite, and shows general disorder and fever. The condition may end in recovery, in abscess, induration, or gangrene, and in some cases may lay the foundation for a tumor of the gland.

The *treatment* is simple so long as there is only congestion. Active rubbing with lard or oil, or better, camphorated oil, and the frequent drawing off of the milk, by the foal or with the hand, will usually bring about a rapid improvement. When active inflammation is present fomentation with warm water may be kept up for an hour and followed by the application of the camphorated oil, to which has been added some carbonate of soda and extract of belladonna. A dose of laxative medicine (4 drams Barbadoes aloes) will be of service in reducing fever, and one half ounce saltpeter daily will serve a similar end. In case the milk coagulates in the udder and can not be withdrawn, or when the liquid becomes fetid, a solution of 20 grains carbonate of soda and 10 drops carbolic acid dissolved in an ounce of water should be injected into the teat. In doing this it must be noted that the mare has three separate ducts opening on the summit of each teat and each must be carefully injected. To draw off the fetid product it may be needful to use a small milking tube, or spring teat-dilator designed by the writer (Plate VIII,

figs. 2 and 3.) When pus forms and points externally, and can not find a free escape by the teat, the spot where it fluctuates must be opened freely with the knife and the cavity injected daily with the carbolic acid lotion. When the gland becomes hard and indolent it may be rubbed daily with iodine ointment 1 part, vaseline 6 parts.

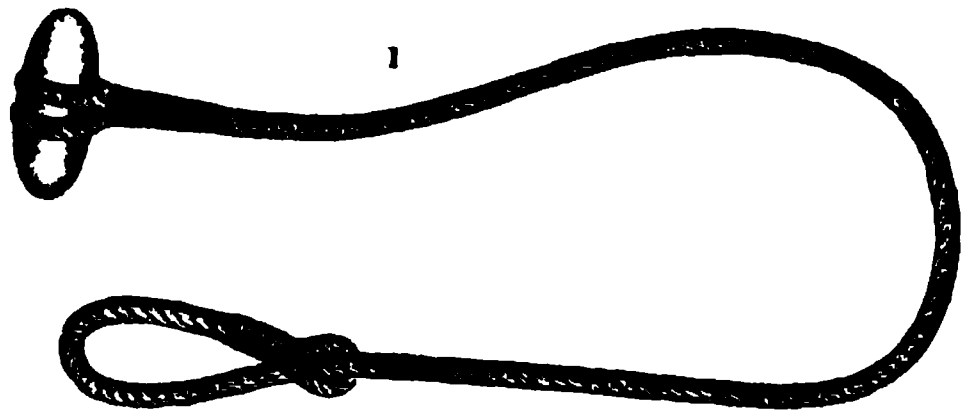
TUMORS OF THE UDDER.

As the result of inflammation of the udder it may become the seat of an indurated diseased growth, which may go on growing and seriously interfere with the movement of the hind limbs. If such swellings will not give way in their early stages to treatment by iodine the only resort is to cut them out with a knife. As the gland is often implicated and has to be removed, such mares can not in the future suckle their colts, and therefore should not be bred.

SORE TEATS, SCABS, CRACKS, WARTS.

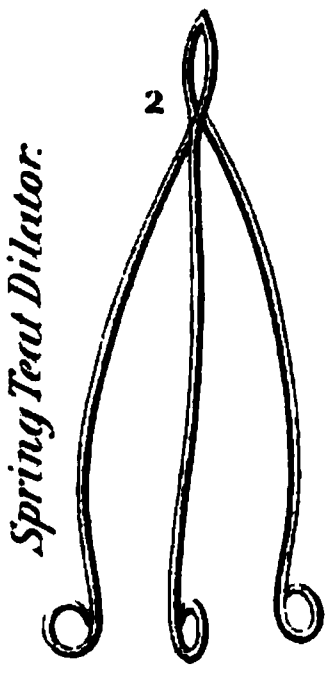
By the act of sucking, especially in cold weather, the teats are subject to abrasions, cracks, and scabs, and as the result of such irritation, or independently, warts sometimes grow and prove troublesome. The warts should be clipped off with sharp scissors and their roots burned with a solid pencil of lunar caustic. This is best done before parturition to secure healing before suckling begins. For sore teats use an ointment of vaseline 1 ounce, balsam of tolu 5 grains, and sulphate of zinc 5 grains.

PLATE VIII.



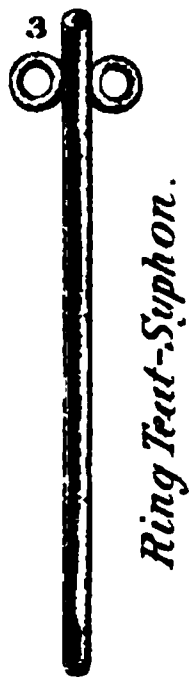
1

Schaack's Traction Cord.



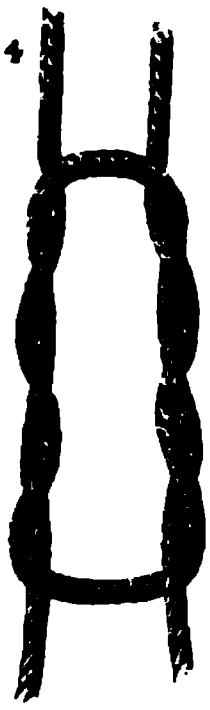
2

Spring Teat Dilator.



3

Ring Teat-Syphon.

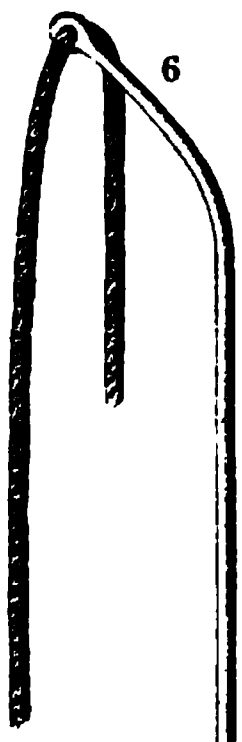


4

Loop of Delwart's Truss.

5

Repeller.



6

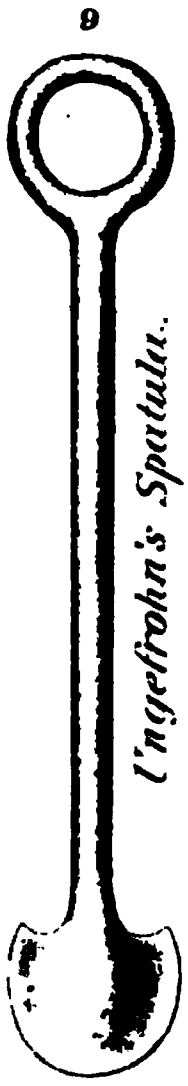
Curved Currier with cord.

7

Instrument used to rotate the Foetus.

8

Simple Short Crotchet-Forceps.



9

Ingelrohn's Spatula.

10

Simple Long Crotchet-Forceps.

Haines, del after Fleming.

Sackett & Wilhelms Litho Co N Y

INSTRUMENTS USED IN DIFFICULT LABOR.

PLATE IX

1

Vertebro Sacral presentation

2

Lumbo Sacral presentation

Hanes, del

Seebert & Williams Lith Co N.Y.

NORMAL PRESENTATIONS.

Transverse presentation Upper view

Sterno-abdominal presentation Head and Feet engaged

Haines, after Fleming

Transverse presentation Upper view

Sterno abdominal presentation Head and Feet engaged

Haines, after Fleming

1

2

9

Anterior presentation. Hind limb deviation.

Haines,del

ABNORMAL PRESENTATIONS.

PLATE XIII.

1

Anterior presentation. Head turned on side.

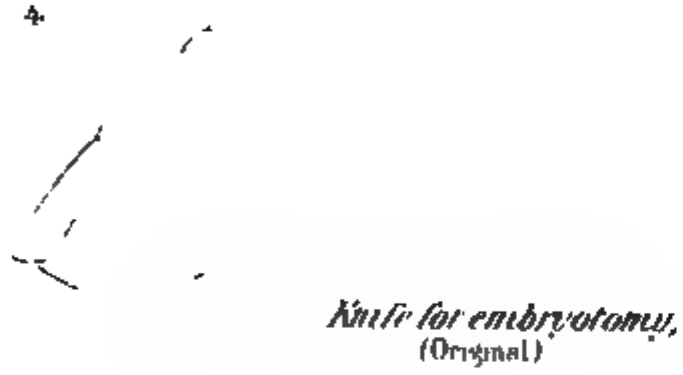
2

Anterior presentation. Head turned on back.

Haines, del.

Sarneu & Williams, Litho Co. N.Y.

ABNORMAL PRESENTATIONS.



Knife for embryotomy,
(Original)

Anterior presentation. Downward deviation of the head,
after Fleming

Deformed pelvis,
after Fleming

mes del

Anterior Presentations: VARIOUS CAUSES OF DIFFICULT LABOR.

Sackett & Wilhelms Litho Co. N.Y.

organs. The nerve cells, however, besides transmitting impulses, act as physiological centers for automatic or reflex movements, and also for the sensory, perceptive, trophic, and secretory functions. A nerve consists of a bundle of tubular fibers, held together by a dense areolar tissue, and inclosed in a membranous sheath—the neurilemma. Nerve fibers possess no elasticity, but are very strong. Divided nerves do not retract.

Nerves are thrown into a state of excitement when stimulated, and are, therefore, said to possess *excitable* or *irritable properties.* The stimuli may be applied to, or may act upon any part of the nerve. Nerves may be paralyzed by continuous pressure being applied. When the nerves divide into branches, there is never any splitting up of their ultimate fibers, nor yet is there ever any coalescing of them; they retain their individuality from their source to their termination.

Nerves which convey impressions to the centers are termed *sensory* or *centripetal*, and those which transmit stimulus from the centers to organs of motion are termed *motor* or *centrifugal.*

The function of the nervous system may, therefore, be defined in the simplest terms, as follows: *It is intended to associate the different parts of the body in such a manner that stimulus applied to one organ may excite or depress the activity of another.*

The brain is that portion of the cerebro-spinal axis within the cranium, which may be divided into four parts—the *medulla oblongata*, the *cerebellum*, the *pons Varolii*, and the *cerebrum*, and it is covered by three membranes called the meninges. The first of these membranes, the *dura mater*, is a thick, white, fibrous membrane which lines the cavity of the cranium, forming the internal periosteum of the bones; it is continuous with the spinal cord to the extremity of the canal. The second, the *arachnoid*, is a delicate serous membrane, and loosely envelops the brain and spinal cord; it forms two layers, leaving between them the arachnoid space which contains the cerebro-spinal fluid, the use of which is to protect the spinal cord and brain from pressure. The third, the *pia mater*, is closely adherent to the entire surface of the brain, but is much thinner and more vascular than when it reaches the spinal cord which it also envelops, and is continued to form the sheaths of the spinal nerves.

The *medulla oblongata* is the prolongation of the spinal cord, extending to the pons Varolii. This portion of the brain is very large in the horse; it is pyramidal in shape, the narrowest part joining the cord.

The *pons Varolii* is the transverse projection on the base of the brain, betwcen the medulla oblongata and the peduncles of the cerebrum.

The *cerebellum* is lodged in the posterior part of the cranial cavity, immediately above the medulla oblongata; it is globular or elliptical in shape, the transverse diameter being greatest. The body of the cerebellum is composed of gray matter externally and white in the center.

The *cerebrum*, or brain proper, occupies the anterior portion of the

cranial cavity. It is ovoid in shape, with an irregular flattened base, and consists of lateral halves or hemispheres. The greater part of the cerebrum is composed of white matter. The hemispheres of the cerebrum are usually said to be the seat of all psychical activities. Only when they are intact are the processes of feeling, thinking, and willing possible. After they are destroyed, the organism comes to be like a complicated machine, and its activity is only the expression of the internal and external stimuli which act upon it. The cerebellum is the great and important central organ for the finer co-ordination and integration of movements. Injuries to the cerebellum cause disturbance of the equilibrium of the body, but do not interfere with the psychical activities or the will or consciousness, neither does an injury to these parts give rise to pain.

The *spinal cord* or spinal marrow is that part of the cerebro-spinal system which is contained in the spinal canal of the backbone, and extends from the medulla oblongata to a short distance behind the loins. It is an irregularly cylindrical structure, divided into two lateral symmetrical halves by fissures. The spinal cord terminates posteriorly in a pointed extremity, which is continued by a mass of nervous trunks—*cauda equinæ*. A transverse section of the cord reveals that it is composed of white matter externally and of gray internally. The spinal cord does not fill up the whole spinal canal. The latter contains, besides, a large venous sinus, fatty matter, the membranes of the cord, and the cerebro-spinal fluid.

The spinal nerves, forty-two or forty-three in number, arise each by two roots, a superior or sensory and an inferior or motor. The nerves originating from the brain are twenty-four in number, and arranged in pairs, which are named first, second, third, etc., counting from before backward. They also receive special names, according to their functions, or the parts to which they are distributed, viz :

1. Olfactory.
2. Optic.
3. Oculo-motor.
4. Pathetic.
5. Trifacial.
6. Abducens.
7. Facial.
8. Auditory.
9. Glosso-Pharyngeal.
10. Pneumogastric.
11. Spinal-Accessory.
12. Hypoglossal.

INFLAMMATION OF THE BRAIN AND ITS MEMBRANES.

Inflammation may attack these membranes singly, or any one of the anatomical divisions of the nerve matter, or it may invade the whole at once. Practical experience, however, teaches us that primary inflammation of the dura mater is of rare occurrence, except in direct mechanical injuries to the head or diseases of the bones of the cranium. Neither is the arachnoid often affected with acute inflammation except as a secondary result. The pia mater is most commonly the seat of inflammation, acute and subacute, but from its intimate relation with the surface of the brain the latter very soon becomes involved in the

morbid changes. Practically, we can not separate inflammation of the pia mater from that of the brain proper. Inflammation may, however, exist in the center of the great nerve masses, the cerebrum, cerebellum, pons Varolii, or medulla at the base of the brain, without involving the surface. When, therefore, inflammation invades the brain and its enveloping membranes it is properly called *encephalitis;* when the membranes alone are affected it is called *meningitis;* or the brain substance alone, *cerebritis.*

ENCEPHALITIS—INFLAMMATION OF THE BRAIN AND ITS MEMBRANES.

Causes.—Exposure to extreme heat or cold, excessive continued cerebral excitement, direct injuries to the brain, such as concussion, or from fracture of the cranium, sometimes as a sequelæ to influenza, pyæmia, poisons having a direct influence upon the encephalic mass, etc.

Symptoms.—Acute encephalitis may be ushered in by an increased sensibility to noises, with more or less nervous excitability, contraction of the pupil of the eyes, and a quick, hard pulse. In very acute attacks these symptoms, however, are not always noted. This condition will soon be followed by muscular twitchings, convulsive or spasmodic movements, eyes wide open with shortness of sight. The animal becomes afraid to have his head handled. Convulsions and delirium will develop, with inability of muscular control, or stupor and coma may supervene. Where the membranes are greatly implicated convulsions and delirium with violence may be expected, but where the brain substances is principally affected stupor and coma will be the prominent symptoms. In the former condition the pulse will be quick and hard, in the latter soft or depressed with often a dilatation of the pupils, and deep, slow, sterterous breathing. The symptoms may follow one another in rapid succession, and the disease approach a fatal termination in less than twelve hours. In subacute attacks the symptoms are better defined, and the animal seldom dies before the third day. Within three or four days gradual improvement may become manifest, or cerebral softening with partial paralysis may occur. In all cases of encephalitis there is a marked rise in temperature from the very onset of the disease, with a tendency to increase until the most alarming symptoms develop, succeeded by a decrease when coma becomes manifested. The violence and character of the symptoms greatly depend upon the extent and location of the structures involved. Thus, in some cases we may find marked paralysis of certain muscles, while in others we may have spasmodic rigidity of muscles in a certain region. Very rarely the animal becomes extremely violent early in the attack, and by rearing up, striking with the fore feet, or falling over, may do himself great injury. Usually, however, the animal maintains the standing position, propping himself against the manger or wall until he falls from inability of muscular control or unconsciousness. Occasionally he may go through a

series of automatic movements in his delirium, such as trotting or walking, and if loose in a stall will move around in a circle persistently. Early and persistent constipation of the bowels is a marked symptom in nearly all acute affections of the brain; retention of the urine, also, is frequently observed.

Chronic encephalitis.—This may succeed the acute stage, or may be due to stable miasma, blood-poison, narcotism, lead-poisoning, etc. Contrary to acute encephalitis, this form is not characterized in its initial stages by excitability, quick and hard pulse, and high fever. The animal appears at first stupid; eats slowly; the pupil of the eye does not respond to light quickly; the animal often throws up his head or shakes it as if suffering sudden twinges of pain. He is slow and sluggish in his movements, or there may be partial paralysis of one limb, one side of the face, neck, or body. These symptoms, with some variations, may be present for several days and then subside, or the disease may pass into the acute stage and terminate fatally. Chronic encephalitis may affect an animal for ten days or two weeks without much variation in the symptoms before the crisis is reached. If improvement commences the symptoms usually disappear in the reverse order in which they developed with the exception of the paralytic effects, which remain intractible or permanent. Paralysis of certain sets of muscles is a very common result of chronic, subacute, and acute encephalitis, and is due to softening of the brain, or to exudation into the cavities of the brain or arachnoid space.

MENINGITIS—THE MAD STAGGERS OF THE OLD WRITERS—INFLAMMATION OF THE CEREBRAL ENVELOPES.

Causes.—Excess of heat or cold, wounds of the cranium and membranes, rheumatism, influenza, rupture of meningeal blood-vessels, etc.

Symptoms.—In an attack of acute meningitis the symptoms appear very suddenly and are often extremely violent. The violent pain in the head is indicated by the animal flying back in the halter, plunging forward or running ahead, regardless of obstacles or obstructions in the way. The pulse is very rapid, the breathing accelerated or panting, the pupils of the eyes contracted, and the muscles of the body quivering. All these symptoms may develop within a few minutes or in a few hours. If the animal does not obtain relief, spasms or rigidity of the muscles along one or both sides of the neck or back will become manifest, the head will be held elevated, the eyeballs will retract into their sockets, the eye-lids twitch, convulsions and furious delirium will soon appear, followed by coma and death. Acute meningitis may result fatally in a very few hours. During the whole course of the disease the more violent symptoms occur in paroxysms, and the least noise or disturbance serves to induce them. In the quiescent periods the animal appears dull and drowsy. The urine is frequently ejected in spurts and strong efforts are made to pass manure. In *subacute*

meningitis the symptoms will develop more slowly and be less marked by violence. The sensory functions may not be much interfered with until the near approach of death. In such attacks the animal may suffer for a week or longer and ultimately recover. In meningitis the temperature varies from 103° to 107° F., according to the severity of the attack.

The violent symptoms of this disease must not be confounded with those of rabies. In the latter the violence is directed at some object or upon the animal himself; in the former no malice is shown toward the attendant or surrounding objects, but is simply the manifestation of excruciating pain in the head. Meningitis may be distinguished from encephalitis and cerebritis by the absence of marked localized paralytic symptoms, or of coma, until the near approach of death. It is characterized by violence, increased sensibility, and delirium.

CEREBRITIS—INFLAMMATION OF THE BRAIN SUBSTANCE.

Causes.—The causes giving rise to this disease are very numerous. Among them may be mentioned all those named heretofore as causing encephalitis and meningitis, cystic and calcareous tumors, thrombi, uræmic poisoning, metastatic abscesses, septic infection, etc.

Symptoms.—Cerebritis, when unaccompanied by other disease, is seldom recognized as such during life. It is always localized in extent, and the symptoms manifested depend upon the location of the organic change for their character. The symptoms, therefore, are as varied as the causes; they are usually of slow development and persistent. Vertigo or giddiness may be regarded as a constant symptom. The animal may stop on the road, shake his head, or stagger, apparently undecided in what direction to go. There may be contraction of the pupils, cramp of the muscles on the side of the neck or face, pulse small and hard and variable in frequency, often, however, slower than normal. The temperature is slightly increased, the respirations may be slow and deep, the appetite capricious, bowels constipated; rapid emaciation is a common symptom. Such conditions may be apparent for a week or two weeks; then the horse may become comatose. The pupils dilate, the pulse becomes intermitting, swallowing difficult, the muscles which were previously rigid become relaxed and paralyzed, and the urine may either be retained or be discharged involuntarily. In this way the animal may survive another week and then die in a paralyzed and unconscious state. Not infrequently, however, few of those symptoms are manifested, for in some cases the paralysis is sudden from extensive lesions of the brain, and the animal may die within twenty-four hours.

SOFTENING AND ABSCESS OF THE BRAIN.

This is one of the terminations of cerebritis. It may also be due to an insufficient supply of blood as a result of diseased cerebral arteries and of apoplexy.

Symptoms.—Drowsiness, vertigo, or attacks of giddiness, increased timidity, or fear of familiar objects, paralysis of one limb, hemiplegia, imperfect control of the limbs, and usually a weak, intermittent pulse. In some cases the symptoms are analagous to those of apoplexy. The character of the symptoms depends upon the seat of the softening or abscess within the brain.

CEREBRAL SCLEROSIS.

This is a result of an inflammation in the structure of the brain affecting the connective tissues, which eventually become hypertrophied and press upon nerve cells and fibers, causing their ultimate disappearance, leaving the parts hard and indurated.

Symptoms.—This condition gives rise to a progressive paralysis, and may extend along a certain bundle of fibers into the spinal cord. Complete paralysis almost invariably supervenes and causes death.

PATHOLOGY OF ACUTE BRAIN AFFECTIONS.

On making *post mortem* examinations of horses which have died in the first stages of either of those diseases, we will find an excessive engorgement of the capillaries and small blood-vessels, with correspondingly increased redness and molecular changes in both contents and the walls of the vessels. If the death has occurred at a later period of the disease, in addition to the redness and engorgement we will find that an exudation of the contents of the blood-vessels into the tissues and upon the surfaces of the inflamed parts has supervened. If the case has been one of encephalitis we will usually find more or less watery fluid in the ventricles (natural cavities in the brain), in the sub-arachnoid space, and a serous exudation between the convolutions and interstitial spaces of the gray matter under the membranes of the brain. The amount of fluid varies in different cases. In some where the animal's blood was very plastic, exudations of a membranous character may be present and are found attached to the surface of the pia mater.

In meningitis, especially in chronic cases, in addition to the serous effusion, we find changes which may be regarded as characteristic in the formation of a delicate and highly vascular layer or layers of membrane or organized structure on the surface of the dura mater, and also indications of hemorrhages in connection with the membranous formations. Hæmatoma or blood tumors may be found embedded in this membrane. In some cases the hemorrhages are copious, causing paralysis or apoplexy, followed by speedy death.

In cerebritis, or inflammation of the interior of the brain, there is a tendency to softening and suppuration and the formation of abscesses. In some cases the abscesses are small and numerous, surrounded with a softened condition of the brain matter, and sometimes we may find one large abscess. In cases of recent development the walls of the abscesses are fringed and ragged and have no lining membrane. In older

or chronic cases, the walls of the abscesses are generally lined with a strong membrane, often having the appearance of a sac or cyst, and the contents have a very offensive odor.

Treatment.—In all acute attacks of inflammation involving the membranes or cerebral masses, it is the pressure from the distended and engorged blood-vessels, and the rapid accumulation of inflammatory products, that endangers the life of the animal in even the very early stage of the disease. The earlier the treatment is commenced to lessen the danger of fatal pressure from the engorged blood-vessels, the less amount of inflammatory products and effusion we have to contend with later on. The leading object then to be accomplished in the treatment of the first stages of encephalitis, meningitis, or cerebritis is to relieve the engorgement of the blood-vessels before a dangerous degree of effusion or exudation has taken place, and thereby lessen the irritation or excitability of the affected structures. If we fully succeed in this stage in the accomplishment of this object, we certainly prevent a second stage of the disease, and it will only be required to continue a treatment which will tend to lessen irritability to prevent a second engorgement from taking place. But if the attempt to relieve the engorgement in the first stage has been only partially successful, and the second stage with its inflammatory products and exudations, whether serous or plastic, has set in, then the main objects in further treatment are to keep up the strength of the animal and hasten the absorption of the exudative products as much as possible. To obtain these results, when the animal is found in the initial stage of the disease, where there is unnatural excitability or stupor with increase of temperature and quickened pulse, we must rely upon the safest and quickest acting remedy at hand, which is copious bleeding from the jugular vein. Especially in acute meningitis, bleeding is imperatively demanded. The finger should be kept on the pulse, and the blood allowed to flow until there is a marked fluttering or softening of the pulse. As soon as the animal recovers somewhat from the shock of the bleeding, the following medicine should be made into a ball or dissolved in a pint of warm water, and be given at one dose: Barbadoes aloes, 7 drams; calomel, 2 drams; powdered ginger, 1 dram; tincture of aconite, 20 drops.

The animal should be placed in a cool, dark place, as free from noise as possible, and cloths wrung out of hot water placed on his head. These should be renewed frequently for at least twelve hours. When the animal becomes thirsty half an ounce of saltpeter may be dissolved in his drinking water every six hours. Injections of warm water into the rectum may facilitate the action of the purgative. Norwood's tincture of veratrum viride, in 20-drop doses, should be given every hour, and one dram of solid extract of belladonna every four hours, until the symptoms become modified and the pulse regular and full.

If this treatment fails to give relief the disease will pass into the advanced stages, or if the animal has been neglected in the early stages

the treatment must be supplanted with the hypodermic injection of ergotin, in 5-grain doses, dissolved in a dram of water, every six hours. The limbs may be poulticed above the fetlocks with mustard. Cold water or ice-bags should now take the place of the hot-water cloths on the head. Warm blanketing, to promote perspiration, is to be observed in all cases in which there is no excessive perspiration.

If the disease becomes chronic—encephalitis or meningitis—we must place our reliance upon alteratives and tonics, with such incidental treatment as special symptoms may demand. Iodide of potassium in 2-dram doses should be given twice a day, and 1 dram of calomel once a day, to induce absorption of effusions or thickened membranes. Tonics, in the form of iodide of iron in dram doses, to which is added 2 drams of powdered hydrastis, may also be given every six or eight hours, as soon as the active fever has abated. In all cases, after the disappearance of the acute symptoms, blisters (cantharides ointment) should be applied behind the poll. When paralytic effects remain after the disappearance of all other symptoms, sulphate of strychnia in 2-grain doses, in combination with the other tonics, may be given twice a day, and be continued until it produces muscular twitching. In some cases of paralysis, as of the lips or throat, benefit may be derived from the moderate use of the electric battery. Many of the recoveries will, however, under the most active and early treatment, be but partial, and in all cases the animals become predisposed to subsequent attacks. A long period of time should be allowed to pass before the animal is exposed to severe work or great heat. When the disease depends upon mechanical injuries they have to be treated and all causes of irritation to the brain removed. If it is due to stable miasma, uræmic poisoning, pyæmia, influenza, rheumatism, toxic agents, etc., they should receive prompt attention for their removal or mitigation.

Cerebral softening, abscess, or sclerosis, are practically inaccessible to treatment, otherwise than such relief as may be afforded by the administration of opiates and general tonics, and, in fact, the diagnosis is largely presumptive.

CONGESTION OF THE BRAIN—MEGRIMS.

Congestion of the brain consists in an accumulation of blood in the vessels, also called hyperæmia, or engorgement. It may be active or passive—active when there is an undue determination of blood or diminished arterial resistance, and passive when it accumulates in the vessels of the brain, owing to some obstacle to its return by the veins.

Causes.—Active cerebral congestion may be due to hypertrophy of the left ventricle of the heart, excessive exertion, the influence of extreme heat, sudden and great excitement, artificial stimulants, etc. Passive congestion may be produced by any mechanical obstruction which prevents the proper return of blood through the veins to the heart, such as small or ill-fitting collar, which often impedes the blood

current, tumors or abcesses pressing on the vein in its course, and organic lesions of the heart with regurgitation.

Extremely fat animals with short thick necks are peculiarly subject to attacks of cerebral congestion. Simple congestion, however, is merely a functional affection, and in a slight or moderate degree involves no immediate danger. Extreme engorgement, on the contrary, may be followed by rupture of previously weakened arteries and capillaries and cause immediate death, designated then as a stroke of apoplexy.

Symptoms.—Congestion of the brain is usually sudden in its manifestation and of short duration. The animal may stop very suddenly and shake his head or stand quietly braced on his legs, then stagger, make a plunge, and fall. The eyes are staring, breathing hurried and stertorous, and the nostrils widely dilated. This may be followed by coma, violent convulsive movements, and death. Generally, however, the animal gains relief in a short time, but he may remain weak and giddy for several days. If it is due to organic change of the heart or to disease of the blood-vessels in the brain, then the symptoms may be of slow development manifested by drowsiness, dimness or imperfect vision, difficulty in voluntary movements, diminished sensibility of the skin, loss of consciousness, delirium, and death. In milder cases effusion may take place in the arachnoid spaces and ventricles of the brain followed by paralysis and other complications.

Pathology.—In congestion of the brain the cerebral vessels are loaded with blood, and the venous sinuses distended to an extreme degree, and the pressure exerted upon the brain constitutes actual compression, giving rise to the symptoms just mentioned. On *post mortem* examinations this engorgement is found universal throughout the brain and its membranes, which serves to distinguish it from inflammations of these structures, in which the engorgements are confined more or less to circumscribed portions. A prolonged congestion may, however, lead to active inflammation, and in that case we will find serous and plastic exudations in the cavities of the brain. In addition to the intensely engorged condition of the vessels we find the gray matter of the brain redder in color than natural. In cases where several attacks have occurred the blood-vessels are often found permanently dilated.

Treatment.—Prompt removal of all mechanical obstructions to the circulation. If it is due to venous obstruction by too tight a collar, the loosening of the collar will give immediate relief. If due to tumors or abscesses, a surgical operation becomes necessary to afford relief. To revive the animal if he become partially or totally unconscious cold water should be dashed on the head, and if this does not afford ready relief recourse must be had to bleeding to lessen arterial tension. Tincture of veratrum viride or of aconite root may be given in twenty-drop doses every hour until consciousness returns. If the limbs are cold tincture of capsicum or strong mustard water should be applied to them. If symptoms of paralysis remain after two or three days, an active

cathartic and iodide of potassa will be indicated, to be given as prescribed for inflammation of the brain.

Prevention.—Well adjusted collar, with strap running from the collar to the girth, to hold down the collar when pulling up grade; regular feed and exercise, without allowing the animal to become excessively plethoric; moderate checking, allowing a free and easy movement of the head; well ventilated stabling, proper cleanliness, pure water, etc.

SUNSTROKE—HEAT EXHAUSTION.

The term sunstroke is applied to affections occasioned not exclusively by exposure to the sun's rays, as the word signifies, but by the action of great heat combined generally with other causes, such as dryness and rarefaction of the air and an unusual accumulation of electricity. Exhaustion produced by a long continued heat is often the essential factor, and is called heat exhaustion. Horses on the race track undergoing protracted and severe work in hot weather often succumb to heat exhaustion. Draught horses exposed to the direct rays of the sun for many hours, which do not receive proper care in watering, feeding, rest in shady places, suffer very frequently from sunstroke.

Symptoms.—Sunstroke is manifested suddenly. The animal stops, drops his head, begins to stagger, and soon falls to the ground unconscious. The breathing is marked with great stertor, the pulse is very slow and irregular, cold sweats break out in patches on the surface of the body, and the animal often dies without recovering consciousness.

In heat exhaustion the animal usually requires urging for some time previous to the appearance of any other symptoms, generally perspiration is checked, and then he becomes weak in his gait, the breathing hurried or panting, eyes watery and bloodshot, nostrils dilated and highly reddened, assuming a dark, purple color; the pulse is rapid and weak, the heart bounding, followed by unconsciousness and death. If recovery takes place convalescence extends over a long period of time, during which incoördination of movement may persist.

Pathology.—Sunstroke, virtually active congestion of the brain, often accompanied by effusion and blood extravasation, characterizes this condition, with often rapid and fatal lowering of all the vital functions. The death may be due in many instances to the complete stagnation in the circulation of the brain, inducing anæmia or want of nourishment of that organ. In other cases it may be directly due to the excessive compression of the nerve matter controlling the heart's action, and cause paralysis of that organ.

Treatment.—Under no circumstances is blood-letting permissible in sunstroke. Ice or very cold water should be applied to the head and along the spine and half an ounce of carbonate of ammonia or 6 ounces of whisky should be given in a pint of water. Injections, per rectum, of moderately strong ginger tea or weak ammonia water may be used with benefit. Brisk friction of the limbs and the application of spirits

of camphor often yield good results. The administration of the stimulants should be repeated in one hour if the pulse has not become stronger and slower. If the animal is suffering from heat exhaustion similar treatment may be used, with the exception of cold to the head and spine, for in this case cloths wrung out in hot water should be applied. In either case, when reaction has occurred preparations of iron and general tonics may be given during convalescence: Sulphate of iron 1 dram, gentian 3 drams, red cinchona bark 2 drams; mix and give in the feed morning and evening.

Prevention.—In very hot weather horses should have wet sponges or light sun-shades on the head when at work, or the head may be sponged with cold water as many times a day as possible. Proper attention should be given to feeding and watering, never in excess. During the warm months all stables should be cool and well ventilated, and if an animal is debilitated from exhaustive work or disease he should receive such treatment as will tend to build up the system.

An animal which has been affected with sunstroke is very liable to have subsequent attacks when exposed to the necessary exciting causes.

APOPLEXY—CEREBRAL HEMORRHAGE.

Apoplexy is often confounded with cerebral congestion, but true apoplexy always consists in rupture of cerebral blood-vessels, with blood extravasation and formation of blood clot.

Causes.—Two causes are involved in the production of apoplexy, the *predisposing* and the *exciting* cause. The predisposing cause is degeneration or disease which weakens the blood-vessel, the exciting cause is any one which tends to induce cerebral congestion.

Symptoms.—Apoplexy is characterized by a sudden loss of sensation and motion, profound coma, and stertorous and difficult breathing. The action of the heart is little disturbed at first, but soon becomes slower, then quicker and feebler, and after a little time ceases. If the rupture is one of a small artery and the extravasation limited, sudden paralysis of some part of the body is the result. The extent and location of the paralysis depend upon the location within the brain which is functionally deranged by the pressure of the extravasated blood; hence these conditions are very variable.

In the absence of any premonitory symptoms or an increase of temperature in the early stage of the attack we may be reasonably certain in making the distinction between this disease and congestion of the brain or sunstroke.

Pathology.—In apoplexy we are generally able to find an atheromatous condition of the cerebral vessels with weakening and degeneration of their walls. When a large artery has been ruptured it is usually followed by immediate death, and large rents may be found in the cerebrum, with great destruction of brain tissue, induced by the forcible pressure of the liberated blood. In small extravasations producing

local paralysis without marked general disturbance, the animal may recover after a time; in such cases gradual absorption of the clot takes place. In large clots atrophy of the brain substance may follow, or softening and abscess from want of nutrition may result, and render the animal worthless, ultimately resulting in death.

Treatment.—Place the animal in a quiet, cool place, avoid all stimulating food. Administer, in his drinking water or feed, 2 drams of the iodide of potassa twice a day for several weeks if necessary. Medical interference with sedatives or stimulants is more apt to be harmful than of benefit, and blood-letting in an apoplectic fit is extremely hazardous. From the fact that cerebral apoplexy is due to diseased or weakened blood-vessels, the animal remains subject to subsequent attacks.

COMPRESSION OF THE BRAIN.

Causes.—In injuries from direct violence a piece of broken bone may press upon the brain, and according to its size the brain is robbed of its normal space within the cranium. It may also be due to an extravasation of blood or to exudation in the subdural or arachnoid spaces. Death from active cerebral congestion results through compression. The occurrence may sometimes be traced to the direct cause, which will give assurance for the correct diagnosis.

Symptoms.—Impairment of all the special senses and localized paralysis. All the symptoms of lessened functional activity of the brain are manifested to some degree. The paralysis remains to be our guide for the location of the cause, for it will be found that the paralysis occurs on the opposite side of the body from the location of the injury, and the parts suffering paralysis will denote, to an expert veterinarian or physician, the part of the brain which is suffering compression.

Treatment.—Trephining, by a skillful operator, for the removal of the cause when due to depressed bone or the presence of foreign bodies. When the symptoms of compression follow other acute diseases of the brain, apoplectic fits, etc., the treatment must be such as the exigencies of the case demands.

CONCUSSION OF THE BRAIN.

Causes.—This is generally caused by an animal falling over backward and striking his poll, or perhaps falling forward on his nose; by a blow on the head, etc.

Symptoms.—Concussion of the brain is characterized by giddiness, stupor, insensibility, or loss of muscular power, succeeding immediately upon a blow or severe injury involving the cranium. The animal may rally quickly, or not for hours; death may occur on the spot or after a few days. When there is only slight concussion or stunning the animal soon recovers from the shock. When more severe, insensibility may be complete and continue for a considerable time; the animal lies as if in a deep sleep; the pupils are insensible to light; the pulse fluttering or feeble; the surface of the body cold, muscles

relaxed, and the breathing scarcely perceptible. After a variable interval partial recovery may take place, which is marked by paralysis of some parts of the body, often of a limb, the lips, ear, etc. Convalescence is usually tedious, and frequently permanent impairment of some organs remains.

Pathology.—Concussion produces laceration of the brain, or at least a jarring of the nervous elements, which if not sufficiently severe to produce sudden death may lead to softening or inflammation, with their respective symptoms of functional derangement.

Treatment.—The first object in treatment will be to establish reaction or to arouse the feeble and weakening heart. This can often be accomplished by dashing cold water on the head and body of the animal; frequent injections of weak ammonia water, ginger tea, or oil and turpentine should be given per rectum. In the majority of cases this will soon bring the horse to a state of consciousness. In more severe cases mustard poultices should be applied along the spine and above the fetlocks. As soon as the animal gains partial consciousness stimulants, in the form of whisky or capsicum tea, should be given. Owing to severity of the structural injury to the brain or the possible rupture of blood-vessels and blood extravasation, the reaction may often be followed by encephalitis or cerebritis, and will then have to be treated accordingly. For this reason the stimulants should not be administered too freely, and they must be abandoned as soon as reaction is established. There is no need for further treatment unless complications develop as a secondary result. Bleeding, which is so often practiced, proves almost invariably fatal in this form of brain affection. We should also remember that it is never safe to drench a horse with large quantities of medicine when he is unconscious, for he is very liable to draw the medicine into the lungs in inspiration.

Prevention.—Young horses, when harnessed or bitted for the first few times, should not have their heads checked up high, for it frequently causes them to rear up, and, being unable to control their balance, they are liable to fall over sideways or backwards, thus causing brain concussion when they strike the ground.

ANÆMIA OF THE BRAIN.

This is a physiological condition in sleep.

Causes.—It is considered a disease or may give rise to disease when the circulation and blood supply of the brain are interfered with. In some diseases of the heart the brain becomes anæmic, and fainting fits occur, with temporary loss of consciousness. Tumors growing within the cranium may press upon one or more arteries and stop the supply of blood to certain parts of the brain, thus inducing anæmia, ultimately atrophy, softening, or suppuration. Probably the most frequent cause is found in plugging or occlusion of the arteries by a blood-clot.

Symptoms.—Imperfect vision, constantly dilated pupils, frequently a feeble and staggering gait, and occasionally cramps, convulsions, or epileptic fits occur.

Pathology.—The exact opposite of cerebral hyperæmia. The blood-vessels are found empty, the membranes blanched, and the brain substance softened.

Treatment.—Removal of the remote cause when possible. General tonics, nutritious food, rest, and removal from all causes of nervous excitement.

ATROPHY OF THE BRAIN.

This condition is produced by a fault in nutrition, embracing the causes which induce anæmia. Gradual absorption and shrinking of brain substance may arise from the constant and increasing pressure arising from the growth of tumors, degeneration in the arterial walls, hydrocephalus, etc. Atrophy of the brain may be general or localized. The cerebrum may waste away in a remarkable degree before any indication of disease becomes manifest.

Symptoms.—It may give rise to viciousness, paralysis, disorders of special sensation, coma, etc. Treatment is of no avail.

HYDROCEPHALUS—BRAIN DROPSY.

This disease is most often seen in young foals and is manifested by an unnaturally large forehead. The forehead bulges out, and the cranial bones may be separated from their connections, and a part of the brain be covered by the skin only. Foals seldom survive this affection, and treatment is useless. In horses hydrocephalus is a result of chronic meningitis, when an effusion of serum is poured out into the ventricles and arachnoid spaces of the brain. The disease is sometimes indicated by a difficulty in controlling voluntary movements, coma, etc. When effusion as a result of meningitis is suspected, iodide of potassa in 2-dram doses may be given twice a day and a strong blister applied behind the ears.

TUMORS WITHIN THE CRANIUM.

Tumors within the cranial cavity and the brain occur not infrequently, and give rise to a variety of symptoms, imperfect control of voluntary movement, local paralysis, epilepsy, etc.

Osseous tumors, growing from the walls of the cranium, are not very uncommon.

Dentigerous cysts, containing a formation identical to that of a tooth, growing from the temporal bone, sometimes are found lying loose within the cranium.

Tumors of the choroid plexus, known as *brain sand*, are frequently met with on *post-mortem* examinations, but seldom give rise to any appreci-

able symptoms during life. They are found in horses at all ages, and are of slow development. They are found in one or both of the lateral ventricles, enveloped in the folds of the choroid plexus.

Melanotic tumors have been found in the brain and meninges in the form of small, black nodules, in gray horses, and in one instance are believed to have induced the condition known as string-halt.

Fibrous tumors may develop within or from the meningeal structures of the brain.

Gliomatous tumor is a variety of sarcoma very rarely found in the structure of the cerebellum.

Treatment for tumors of the brain is beyond our ambition in the present age.

SPASMS—CRAMPS.

Causes.—Spasm is a marked symptom in many diseases of the brain and of the spinal cord. Spasms may result from irritation of the motor nerves as conductors, or may result from irritation of any part of the sympathetic nervous system, and they usually indicate an excessive action of the reflex-motor centers. Spasms may be induced by various medicinal agents given in poisonous doses, or by effete materials in the circulation, such as nux vomica or its alkaloid strychnia, lead preparations, or an excess of the urea products in the circulation, etc. Spasms may be divided into two classes: *tonic spasm*, when the cramp is continuous or results in persistent rigidity, as in tetanus; *clonic spasm*, when the cramping is of short duration, or is alternated with relaxations. Cramps may be distinguished from choleraic movements by the extreme pain or suffering which they induce. Spasms may affect involuntary as well as the voluntary muscles, the muscles of the glottis, intestines, and even the heart. They are always sudden in their development.

SPASM OF THE GLOTTIS.

This is manifested by a strangling respiration; a wheezing noise is produced in the act of inspiration; extreme anxiety and suffering for want of air. The head is extended, the body profusely perspiring; pulse very rapid; soon great exhaustion becomes manifest; the mucous membranes become turgid and very dark-colored, and the animal thus may suffocate in a short time.

SPASMS OF THE INTESTINES.

(See "Cramp-colic.")

SPASMS OF THE NECK OF THE BLADDER.

This may be due to spinal irritation, or a reflex from intestinal irritation, and is manifested by frequent but ineffectual attempts to urinate.

SPASM OF THE DIAPHRAGM—THUMPS.

Spasmodic contraction of the diaphragm, the principal muscle used in respiration, is generally occasioned by extreme and prolonged speeding on the race-track or road. The severe strain thus put upon this muscle finally induces irritation of the nerves controlling it, and the contractions become very forcible and violent, giving the jerking character known among horsemen as thumps. This condition may be distinguished from violent beating of the heart by feeling the pulse beat at the angle of the jaw, and at the same time watching the jerking movement of the body, when it will be discovered that the two bear no relation to each other. (See "Palpitation of the Heart.")

SPASM OF THE THIGH, OR CRAMP OF A HIND LIMB.

This is frequently witnessed in horses that stand on sloping plank floors—generally in cold weather—or it may come on soon after severe exercise. It is probably due to an irritation of the nerves of the thigh. In cramps of the hind leg the limb becomes perfectly rigid, and attempts to flex the leg are unsuccessful; the animal stands on the affected limb, but is unable to move it; it is unnaturally cold; it does not, however, appear to cause much suffering unless attempts are made to change position. This cramp may be of short duration—a few minutes—or it may persist for several days. This condition is often taken for a dislocation of the stifle-joint. In the latter the foot is extended backward, and the horse is unable to advance it, but drags the limb after him. An examination of the joint also reveals a change in form. Spasms may affect the eye-lids, by closure or by retraction. Spasm of the sterno-maxillaris muscle has been witnessed, and the animal was unable to close the jaws until the muscle became relaxed.

Treatment.—An anodyne liniment, composed of chloroform 1 part and soap liniment 4 parts, applied to cramped muscles will usually cause relaxation. This may be used where single external muscles are affected. In spasm of the glottis inhalation of sulphuric ether will give quick relief. In spasm of the diaphragm, rest and the administration of half an ounce of chloroform in 3 ounces of whisky, with a pint of water added, will generally suffice to bring relief, or if this fails give 5 grains of sulphate of morphia by hypodermic injection. If spasms result from organic disease of the nervous system, the latter should receive such treatment as its character demands. In cramp of the leg compulsory movement usually causes relaxation very quickly; therefore, the animal should be led out of the stable and be forced to run or trot. Sudden nervous excitement, caused by a crack of the whip or smart blow, will often bring about immediate relief. Should this fail, the anodyne liniment may be used along the inside of the thigh, and chloroform, ether, or laudanum given internally. An ounce of the chloral hydrate will certainly relieve the spasm when given internally,

but the cramp may return soon after the effect has passed off, which in many cases it does very quickly.

Convulsions.—Although there is no disease of the nervous system which can be properly termed convulsive, or justify the use of the word convulsion to indicate any particular disease, yet it is often such a prominent symptom that a few words may not be out of place. General, irregular muscular contractions of various parts of the body, with unconsciousness, characterize what we regard as convulsions, and like ordinary spasms are dependent upon some disease or irritation of the nervous structures, chiefly of the brain. No treatment is required; in fact, a general convulsion must necessarily be self-limited in its duration. Suspending, as it does, respiratory movements, checking the oxygenation and decarbonization of the blood, the rapid accumulation of carbonic acid gas in the blood and the exclusion of oxygen quickly puts the blood in a condition to produce the most reliable and speedy sedative effect upon the nerve excitability that could be found, and consequently furnishes its own remedy, so far as the continuance of the convulsive paroxysm is concerned. Whatever treatment is instituted must be directed towards a removal of the cause of the convulsive paroxysm.

CHOREA.

Chorea is characterized by involuntary contractions of voluntary muscles. This disease is an obscure disorder, which may be due to pressure upon a nerve, cerebral sclerosis, small aneurisms in the brain, etc. Choreic symptoms have been produced by injecting granules of starch into the arteries entering the brain. Epilepsy and other forms of convulsions simulate chorea in appearance.

Stringhalt is by some termed chorea. This is manifested by a sudden jerking-up of one or both hind legs when the animal is walking. This symptom may be very slight in some horses, but has a tendency to increase with the age of the animal. In some the catching-up of the affected leg is very violent, and when it is lowered to the ground the motion is equally sudden and forcible, striking the foot to the ground like a pile-driver. Very rarely chorea may be found to affect one of the fore legs, or the muscles of one side of the neck or the upper part of the neck. Involuntary jerking of the muscles of the hip or thigh is seen occasionally, and is termed shivering by horsemen.

Chorea is often associated with a nervous disposition, and is not so frequent in animals with a sluggish temperament. The involuntary muscular contractions cause no pain, and do not appear to produce much exhaustion of the affected muscles, although the jerking may be regular and persistent whenever the animal is in motion.

Treatment.—In a few cases, early in the appearance of this affection, general nerve tonics may be of benefit, viz, iodide of iron, 1 dram; pulverized nux vomica, 1 dram; pulverized scutellaria, 1 ounce. Mix, and give in the feed once a day for two weeks. If the cause is connected with organic brain lesions treatment is usually unsuccessful.

EPILEPSY—FALLING FITS.

The cause of epilepsy is seldom traceable to any special brain lesions. In a few cases it accompanies disease of the pituitary body, which is located in the under surface of the brain. Softening of the brain may give rise to this affection. Attacks may occur only once or twice a year, or they may be of frequent recurrence.

Symptoms.—No premonitory symptoms precede an epileptic fit. The animal suddenly staggers; the muscles become cramped; the jaws may be spasmodically opened and closed, and the tongue become lacerated between the teeth; he foams at the mouth and falls down in a spasm. The urine flows away involuntarily, and the breathing may be temporarily arrested. The paroxysm soon passes off, and the animal gets on his feet in a few minutes after the return of consciousness.

Treatment.—Dashing cold water on the head during the paroxysm. After the recovery 1 dram of oxide of zinc may be given in his feed twice a day for several weeks, or benefit may be derived from the tonic prescribed for chorea.

COMA—SLEEPY STAGGERS.

This condition, like that of spasm and convulsion, is generally not a disease, but merely a symptom manifested as a result of a variety of brain affections, such as atrophy, chronic meningitis with effusion, tumors in the lateral ventricles, etc. Another form of coma is that which accompanies acute diseases of the brain, wherein the animal may be unconscious, with sterterous breathing, difficult respiration, etc. We meet, however, with a type of coma in horses which can not easily be attributed to any special disease of the brain, unless it be a modified form of congestion, which is sometimes amenable to treatment. This condition is termed *immobilité* by the French, and sleepy staggers by our stablemen. It is usually attributed to habitual overloading of the stomach with bulky food and want of exercise.

Symptoms.—Sleepy staggers is characterized by drowsiness, partial insensibility, sluggish and often staggering gait. The animal is inclined to drop his head in the manger and to go to sleep with a wad of hay in his mouth, which he is apt to drop when he awakens. He will stand for a long time with his legs placed in any awkward position in which the owner may choose to put them. The bowels are constipated, the pulse slow and soft, with no fever or pain. The animal may remain in this condition for many months without much variation of symptoms, or he may become entirely comatose, with delirium or convulsions, and die. Chronic cases are always much better in cold weather than in the summer.

Treatment.—Moderate bleeding from the jugular vein, 1 gallon from a medium-sized horse, and 1½ or 2 gallons from a very large, heavy horse. This should be immediately followed by a cathartic, composed

of aloes 6 drams, croton oil 6 drops, and 1 dram of capsicum, to be made into a ball with hard soap, molasses, or bread soaked in water, and given on an empty stomach. After the cathartic has ceased to operate give one large tablespoonful or half an ounce of the following mixture twice a day: Pulverized hydrastis, pulverized ginger, sodium bicarbonate, of each 4 ounces; mix.

In some cases iodide of potassa in dram doses twice a day, alternated each week with 1 dram of calomel twice a day, will prove successful. In cases where there is a deep coma or almost continuous unconsciousness, ice bags or cold-water cloths should be applied to the head—between the ears, dropping well down over the forehead and extending backward from the ears for 4 or 5 inches.

PARALYSIS—PALSY.

Paralysis is a weakness or cessation of the muscular contraction, by diminution of loss of the conducting power or stimulation of the motor nerves. Paralytic affections are of two kinds, the perfect and the imperfect. The former includes those in which both motion and sensibility are affected; the latter those in which only one or the other is lost or diminished. Paralysis may be general or partial. The latter is divided into hemiplegia and paraplegia. When only a small portion of the body is affected, as the face, a limb, the tail, it is designated by the term local paralysis. When the irritation extends from the periphery to the center it is termed reflex paralysis.

Causes.—They are very varied. Most of the acute affections of the brain and spinal cord may lead to paralysis. Injuries, tumors, disease of the blood-vessels of the brain, etc., all have a tendency to produce suspension of the conducting motive power to the muscular structures. Pressure upon, or the severing of, a nerve causes a paralysis of the parts to which such a nerve is distributed. Apoplexy may be termed a general paralysis, and in non-fatal attacks is a frequent cause of the various forms of palsy.

GENERAL PARALYSIS.

This can not take place without producing immediate death. The term is, however, usually applied to paralysis of the four extremities, whether any other portions of the body are involved or not. This form of palsy is due to compression of the brain by congestion of its vessels, large clot formation in apoplexy, concussion or shock, or any disease in which the whole brain structure is involved in functional disturbance.

HEMIPLEGIA—PARALYSIS OF ONE SIDE OR HALF OF THE BODY.

Hemiplegia is frequently the result of a tumor in the lateral ventricles of the brain, softening of one hemisphere of the cerebrum, pressure from extravasated blood, fracture of the cranium, or it may be due to

poisons in the blood, or to reflex origin. When hemiplegia is due to or the result of a prior disease of the brain, especially of an inflammatory character, it is seldom complete; it may only affect one limb and one side of the head, neck, or muscles along the back, and may pass off in a few days after the disappearance of all the other evidences of the primary affection. In the majority of cases, however, hemiplegia arises from emboli obstructing one or more blood-vessels of the brain, or the rupture of some vessel the wall of which had become weakened by degeneration and the extravasation of blood. Sensibility in most cases is not impaired, but in some there is a loss of sensibility as well as of motion. In some cases the bladder and rectum are involved in the paralysis.

Symptoms.—In hemiplegia the attack may be very sudden, and the animal fall down powerless to move one side of the body; one side of the lips will be relaxed; the tongue may hang out on one side of the mouth; the tail curved around sideways; an inability to swallow food or water may be present, and often the urine dribbles away as fast as it collects in the bladder. Sensibility of the affected side may be entirely lost or only partial; the limbs may be cold, and sometimes unnaturally warm. In cases wherein the attack is not so severe the animal may be able to maintain the standing position, but will have great difficulty in moving the affected side. In such cases the animal may recover from the disability. In the more severe, where there is complete loss of the power of movement, recoveries are rare.

PARAPLEGIA—TRANSVERSE PARALYSIS OF THE HIND EXTREMITIES.

Paralysis of the hind extremities is usually due to some injury, or inflammation affecting the spinal cord. (See "Spinal Meningitis" and "Myelitis.") It may also be due to a reflex irritation from disease of peripheral nerves, to spinal irritation or congestion caused by blood poisons, etc.

Symptoms.—When due to mechanical injury of the spinal cord, from a broken back or spinal hemorrhage, it is generally progressive in its character, although it may be sudden. When it is caused by agents in the blood it may be intermittent or recurrent.

Paraplegia is not difficult to recognize, for it is characterized by a weakness and imperfect control of the hind legs, and powerless tail. The urine usually dribbles away as it is formed and the manure is pushed out, ball by ball, without any voluntary effort, or the passages may cease entirely. When paraplegia is complete, large and ill-conditioned sores soon form on the hips and thighs from chafing and bruising, which have a tendency to quickly weaken the animal and necessitate his destruction.

LOCOMOTOR ATAXIA—INCOÖRDINATION OF MOVEMENT.

This is characterized by an inability to properly control the movement of the limbs. The animal appears usually perfectly healthy, but when he is led out of his stall his legs have a wobbly movement, and he will stumble or stagger, especially in turning. When this is confined to the hind parts it may be termed a modified form of paraplegia, but often it may be seen to affect nearly all the voluntary muscles when they are called into play, and must be attributed to some pressure exerted on the base of the brain.

LOCAL PARALYSIS.

This is frequently met with in horses. It may affect many parts of the body, even vital organs, and it is very frequently overlooked in diagnosis.

FACIAL PARALYSIS.

This is a frequent type of local paralysis, and is due to impairment of function of the motor nerve of the facial muscles, the *portio dura.* The cause may exist at the base of the brain, compression along its course after it leaves the medulla oblongata, or to a bruise after it spreads out on the great masseter muscle.

Symptoms.—A flaccid condition of the cheek muscles, pendulous lips, inability to grasp the food, often a slow and weak movement in chewing, and difficulty and slowness in drinking.

LARYNGISMUS PARALYTICUS—ROARING.

This condition is characterized by roaring, and is usually caused by an inflamed or hypertrophied bronchial gland pressing against the left recurrent laryngeal nerve, which interferes with its conducting power. A similar condition is occasionally induced in acute pleurisy, where the recurrent nerve becomes involved in the diseased process or compressed by plastic exudation.

PARALYSIS OF THE RECTUM AND TAIL.

This is generally the result of a blow or fall on the rump, which causes a fracture of the sacrum bone and injury to the nerves supplying the tail and part of the rectum and muscles belonging thereto. This fracture would not be suspected, were it not for the loss of motion of the tail.

INTESTINAL PARALYSIS.

Characterized by persistent constipation; frequently the strongest purgatives have no effect whatever on the movement of the bowels. In the absence of symptoms of indigestion, or special diseases implicating the intestinal canal, torpor of the bowels must be attributed to

deficient innervation. This condition may depend upon brain affections, or be due to reflex paralysis. Sudden checks of perspiration may induce excessive action of the bowels or paralysis.

PARALYSIS OF THE BLADDER.

This usually affects the neck of the bladder, and is characterized by incontinence of urine—the urine dribbles away as fast as it is secreted.

The cause may be of reflex origin, disease of the rectum, tumors growing within the pelvic cavity, injury to the spinal cord, etc.

PARALYSIS OF THE OPTIC NERVE—AMAUROSIS.

A paralysis of eyesight may occur very suddenly from rupture of a blood vessel in the brain, acute local congestion of the brain, the administration of excessive doses of belladonna or its alkaloid atropia, etc.

Symptoms.—In amaurosis the pupil is dilated to its full extent, the eye looks clear, but does not respond to light.

Paralysis of hearing, of the external ear, of the eyelid, partial paralysis of the heart and organs of respiration, of the blood vessels from injury to the vaso-motor nerves of the œsophagus, or loss of deglutition, palsy of the stomach, all may be manifested when the supply of nervous influence is impaired or suspended.

Treatment.—In all paralytic affections there may be *anæsthesia* or impairment of sensibility in addition to the loss of motion, or there may be *hyperæsthesia* or increased sensibility in connection with the loss of motion. These conditions may call for special treatment in addition to that for loss of motion. Where hyperæsthesia is well marked local anodynes may be needed to relieve suffering. Chloroform liniment or hypodermic injections of from 3 to 5 grains of sulphate of morphia will allay local pain. If there is marked anæsthesia or loss of sensibility it may become necessary to secure the animal in such a way that he can not suffer serious injury from accidents which he can not avoid or feel. In the treatment of any form of paralysis we must always refer to the cause, and attempt its removal if it can be discovered. In cases where the cause can not be determined we have to rely solely upon a general external and internal treatment. Externally, fly-blisters or strong irritant liniments may be applied to the paralyzed parts. In hemiplegia they should be applied along the bony part of the side of the neck; in paraplegia, across the loins. In some cases hot-water cloths will be beneficial. Internally, it is well to administer 1 dram of powdered nux vomica or 2 grains of sulphate of strychnia twice a day until twitching of some of the voluntary muscles occur; then discontinue it for several days, and then commence again with a smaller dose, gradually increasing it until twitching recurs. In some cases Fowler's solution of arsenic in teaspoonful doses twice a day, in the drinking water, proves beneficial. Occasionally benefit may be derived from the application

of the electric current, especially in cases of roaring, facial paralysis, paralysis of the eyelid, etc. Nutritious but not too bulky food, good ventilation, clean stabling, moderate exercise if the animal is capable of taking it, good grooming, etc., should be observed in all cases.

SPINAL MENINGITIS—INFLAMMATION OF THE MEMBRANES ENVELOPING THE SPINAL CORD.

Causes.—This may be induced by the irritant properties of blood-poisons, exhaustion, and exposure, spinal concussion, all forms of injury to the spine, tumors, caries of the vertebræ, rheumatism, etc.

Symptoms.—A chill may be the precursor, a rise in temperature, or a general weakness and shifting of the legs. Soon a painful, convulsive twitching of the muscles sets in, followed by muscular rigidity along the spine, in which condition the animal will move very stiffly and evince great pain in turning. Evidences of paralysis or paraplegia develop, retention or incontinence of urine, and oftentimes sexual excitement is present. The presence of marked fever at the beginning of the attack, associated with spinal symptoms, should lead us to suspect spinal meningitis or myelitis. These two conditions usually appear together, or myelitis follows inflammation of the meninges so closely that it is almost impossible to separate the two; practically it does not matter much, for the treatment will be about the same in both cases. Spinal meningitis generally becomes chronic, and is then marked principally by paralysis of that portion, or parts of it, posterior to the seat of the disease.

Pathology.—In spinal meningitis we will find essentially the same condition as in cerebral meningitis; there will be an effusion of serum between the membranes, and often a plastic exudation firmly adherent to the *pia mater* serves to maintain a state of paralysis for a long time after the acute symptoms have disappeared by compressing the cord. Finally, atrophy, softening, and even abscess may develop within the cord. Unlike in man, it is usually found localized in horses.

Treatment.—Bags filled with ice should be applied along the spine, to be followed later on by strong blisters. The fever should be controlled as early as possible by giving 20 drops of Norwood's tincture of veratrum viride every hour, until the desired result is obtained. One dram of the fluid extract of belladonna, to control pain and vascular excitement of the spinal cord, may be given every five or six hours until the pupils of the eyes become pretty well dilated. If the pain is very intense 5 grains of sulphate of morphia should be injected hypodermically. The animal must be kept as free from excitement as possible. If the urine is retained in the bladder it must be drawn off every four or six hours. In very acute attacks the disease generally proves fatal in a few days. If, however, the animal grows better some form of paralysis is apt to remain for a long time and the treatment will have to be directed then toward a removal of the exudative products and a

strengthening of the system and stimulation of the nervous functions. To induce absorption iodide of potassa in 2 dram doses may be given dissolved in the drinking water twice a day. To strengthen the system, iodide of iron 1 dram twice a day and 1 dram of nux vomica once a day may be given in the feed. Electricity to the paralyzed and weakened muscles is advisable; the current should be weak, but be continued for half an hour two or three times daily. If the disease is due to a broken back, caries of the vertebræ, or some other irremediable cause, the animal should be destroyed at once.

MYELITIS—INFLAMMATION OF THE SUBSTANCE OF THE SPINAL CORD.

This is a rare disease, except as a secondary result of spinal meningitis or injuries to the spine. Poisoning, by lead, arsenic, mercury, phosphorus, carbonic-acid gas, etc., has been known to produce it. Myelitis may be confined to a small spot in the cord or may involve the whole for a variable distance. It may lead to softening, abscess, or degeneration.

Symptoms.—The attack may begin with a chill or convulsions; the muscles twitch or become cramped very early in the disease, and the bladder usually is affected in the outset, in which there may be either retention or incontinence of urine. These conditions are followed by complete or partial paralysis of the muscles posterior to the locality of the inflamed cord, and the muscles begin to waste away rapidly. The paralyzed limb becomes cold and dry, due to the suspension of proper circulation; the joints may swell and become œdematous; vesicular eruptions appear on the skin, and frequently gangrenous sloughs form on the paralyzed parts. It is exceedingly seldom that recovery takes place. In a few instances it may assume a chronic type, when all the symptoms become mitigated, and thus continue for some time until septicæmia, pyæmia, or exhaustion causes death.

Pathology.—The inflammation may involve nearly the whole length of the cord, but generally it is more intense in some places than others; when due to mechanical injury the inflammation may remain confined to a small section. The cord is swollen and congested, reddened, often softened and infiltrated with pus cells, and the nerve elements are degenerated.

Treatment.—Similar to that of spinal meningitis.

SPINAL SCLEROSIS.

This is the sequence of myelitis, when some mild form of the disease has been existing. Thickening and hardening of the interstitial tissues of the cord, the result of inflammatory products, constitute sclerosis. The affected section has a gray appearance, is firmer than the surrounding tissue, sometimes presents a depressed surface and at other times may be elevated above the general level of the cord.

Symptoms.—Paralysis of sensation or motion in local muscles, and when located in the region of the neck may present the symptoms of locomotor ataxia or inco-ordination of movement. Spinal sclerosis may be suspected when these symptoms succeed an attack of myelitis.

Treatment.—The iodide of iron may be given in dram doses twice a day for a week, alternating with two-grain doses of sulphate of strychnia twice a day for a week.

SPINAL CONGESTION AND SPINAL HYPERÆMIA.

The distinction between congestion and hyperæmia is one of degree rather than kind. In both we find an excess of blood. In hyperæmia the current is unusually rapid, in congestion it is unusually slow. The distinction between hyperæmia and inflammation is also difficult to make; one is only the forerunner of the other. As the blood vessels of the pia mater are the principal source of supply to the spinal cord, hyperæmia of the cord and of the meninges usually go together. The symptoms are, therefore, closely allied to those of spinal meningitis and myelitis. When the pia mater is diseased the spinal cord is almost invariably affected also.

Cause.—Sudden checking of the perspiration, violent exercise, blows, and falls.

Symptoms.—The symptoms may vary somewhat with each case, and closely resemble the first symptoms of spinal meningitis, spinal tumors, and myelitis. First, some disturbance in movement, lowering of the temperature, and partial loss of sensibility posterior to the seat of the congestion. If in the cervical region it may cause interference in breathing and the action of the heart. When in the region of the loins there may be loss of control of the bladder. When the congestion is sufficient to produce compression of the cord, paraplegia may be complete. Usually fever, spasms, muscular twitching, or muscular rigidity are absent, which will serve to distinguish spinal congestion from spinal meningitis.

Treatment.—Hot-water applications to the spine, one-dram doses fluid extract of belladonna repeated every four hours, and tincture of aconite root 20 drops every hour until the symptoms become ameliorated. If no inflammatory products occur the animal is likely to recover.

SPINAL ANÆMIA.

This may be caused by extreme cold, exhausting diseases, spinal embolism or plugging of a spinal blood-vessel, an interference with the circulation through the abdominal aorta, from compression, thrombosis, or aneurism of that vessel; the spinal vessels may be caused to contract through vaso-motor influence, a result of peripheral irritation of some nerve.

Symptoms.—Spinal anæmia causes paralysis of the muscles used in extending the limbs. When the bladder is affected it *precedes* the weakness of motion, while in spinal congestion it follows, and *increased* sensibility, in place of diminished sensibility, as in spinal congestion, is observed. Pressure along the spine causes excessive pain.

Treatment.—If the exciting cause can be removed the animal recovers; if this fails, the spinal cord may undergo softening.

SPINAL COMPRESSION.

When caused by tumors or otherwise when pressure is slight, it produces a paralysis of the muscles used in extending a limb and contraction of those which flex it. When compression is great it causes complete loss of sensibility and motion posterior to the compressed part of the cord.

Compression of a lateral half of the cord produces motor paralysis, disturbance in the circulation, and difficulty of movement, an increased sensibility on the side corresponding to the compressed section, and a diminished sensibility and some paralysis on the opposite side.

Treatment.—When it occurs as a sequence of a preceding inflammatory disease, iodide of potassa and general tonics are indicated. When due to tumors growing within the spinal canal, or to pressure from displaced bone, no form of treatment will result in any benefit.

SPINAL HEMORRHAGE.

This may occur from changes in the wall of the blood-vessels, in connection with tumors, acute myelitis, traumatic injuries, etc. The blood may escape through the pia mater into the sub-arachnoid cavity, and large clots be formed.

Symptoms.—The symptoms are largely dependent upon the seat and extent of the hemorrhage, as they are principally due to the compression of the cord. A large clot may produce sudden paraplegia accompanied by severe pain along the spine; usually, however, the paralysis of both motion and sensation is not very marked at first; on the second or third day fever is apt to appear, and increased or diminished sensibility along the spine posterior to the seat of the clot. When the bladder and rectum are involved in the symptoms it indicates that the spinal cord is compressed.

Treatment.—In the occurrence of injuries to the back of a horse, whenever there is any evidence of paralysis, it is always advisable to apply bags of ice along the spine to check or prevent hemorrhage or congestion, and 2 drams of the fluid extract of ergot and 20 drops of tincture of digitalis may be given every hour until three doses have been taken. Subsequently tincture of belladonna in half-ounce doses may be given three times a day. If there is much pain, 5 grains of sulphate of morphia, injected under the skin, will afford relief and lessen the excitability of the animal. In all cases the animal should be kept perfectly quiet.

SPINAL CONCUSSION.

This is rarely observed in the horse, and unless it is sufficiently severe to produce well-marked symptoms it would not be suspected. It may occur in saddle-horses from jumping, or it may be produced by falling over an embankment, or a violent fall upon the haunches may produce it. Concussion may be followed by partial paralysis or spinal hemorrhage, generally, however, it is confined to a jarring and some disturbance of the nerve elements of the cord, and the paralytic effect which ensues soon passes off. Treatment consists in rest until the animal has completely recovered from the shock. If secondary effects follow from hemorrhage, or compression, they have to be treated as heretofore directed.

SPINAL TUMORS.

Within the substance of the cord glioma, or the mixed gliosarcomata, is found to be the most frequent, tumors may form from the meninges and the vertebræ, being of a fibrous or bony nature, and affect the spinal cord indirectly by compression. In the meninges we may find glioma, cancers, psammoma, fibromata; and aneurisms of the spinal arteries have been discovered in the spinal canal.

Symptoms.—Tumors of the spinal canal cause symptoms of spinal irritation, or compression of the cord. The gradual and slow development of symptoms of paralysis of one or both hind limbs or certain muscles may lead to a suspicion of spinal tumors. The paralysis induced is progressive, but not usually marked with atrophy of the muscles, or increased sensibility along the spine. When the tumor is within the spinal cord itself all the symptoms of myelitis may be present.

Treatment.—General tonics and dram doses of nux vomica may be given; iodide of iron or iodide of potassa in dram doses, three times a day in feed, may, in a very few cases, give some temporary benefit. Usually the disease progresses steadily until it proves fatal.

NEURITIS—INFLAMMATION OF A NERVE.

This is caused by a bruise or wound of a nerve, or to strangulation in a ligature when it is included in the ligation of an artery. The changes in an inflamed nerve are an enlargement, reddening of the nerve sheath, spots of extravasated blood, and sometimes an infiltration of serum mixed with pus.

Symptoms.—Acute pain of the parts supplied by the nerve, and absence of swelling or increased heat of the part.

Treatment.—Hypodermic injections of from 3 to 5 grains of morphia to relieve pain, hot fomentations, and rest. If it is due to an inclusion of a ligature, the nerve should be divided above and below the ligature.

NEUROMA—TUMOR OF A NERVE.

Neuroma may be from enlargement of the end of a divided nerve, or due to fibrous degeneration of a nerve which has been bruised or wounded. Its most frequent occurrence is found after the operation of neurotomy for foot lameness, and it may appear only after the lapse of months, or even years. Neuroma usually develop within the sheath of the nerve with or without implicating the nerve fibers. They are oval, running lengthwise with the direction of the nerve.

Symptoms.—Pain of the affected limb or part is manifested, more especially after resting awhile, and when pressure is made upon the tumor it causes extreme suffering.

Treatment.—Excision of the tumor, including part of the nerve above and below, and then treat it like any other simple wound.

INJURY TO NERVES.

These may consist in wounding, bruising, laceration, stretching, compression, etc. The symptoms which are produced will depend upon the extent, seat, and character of the injury. Recovery may quickly take place, or it may lead to neuritis, neuroma, or spinal or cerebral irritation, which may result in tetanus, paralysis, and other serious derangements. In all diseases, whether produced by some form of external violence or intrinsic causes, the nerves are necessarily involved, and sometimes it is to a primary injury of them that the principal fault in movement or change of nutrition of a part is due. It is often difficult or impossible to discover that an injury to a nerve has been inflicted, but whenever this is possible it may enable us to remedy that which otherwise would result in permanent evil. Treatment should consist in relieving compression, in hot fomentations, the application of anodyne liniments, excision of the injured part, and rest.

CEREBRO-SPINAL MENINGITIS.

This may occur sporadically as an encephalitis, with implications of the spinal cord and its meninges. Usually, however, it appears as an enzoöty in a stable, city, or farming district, not infrequently extending long distances in certain well-defined lines, along rivers, valleys, or along ridges and mountains. For this reason the enzoötic cerebro-spinal meningitis has been attributed by some veterinarians to atmospheric influences. The first written history we have of this disease was published about thirty years ago by Dr. Isaiah Michener, of Carnersville, Pa., in a pamphlet entitled "Paralysis of the Par-Vagum." Several years later Prof. A. Large, of Brooklyn, N. Y., gave it the name of "cerebro-spinal meningitis" on account of its similarity to that disease in the human family. Dr. J. C. Michener, of Colmar, Pa., in 1882, suggested the name of "Fungosus Toxicum Paralyticus," in view of the exciting cause being found in foods undergoing fermentation. In

England a similar disease has been called "grass staggers," due to eating rye grass when it is ripening or when it is cut and eaten while it is heating and undergoing fermentation. In eastern Pennsylvania it was formerly known by the name of "putrid sore throat" and "choking distemper." A disease similar in many respects, which is very prevalent in Virginia, especially along the eastern border, is commonly known by the name of "blind staggers," and in many of the southern States this has been attributed to the consumption of worm-eaten corn. Professor Large attributed the cause of the disease to a lack of sanitary conditions, poisonous gases, or emanations depending upon defective sewerage in cities, defective drainage on lands in the country, and deficient stable ventilation.

These reputed causes, however, are inadequate to account for so-called enzoötic or epidemic cerebro-spinal meningitis. It frequently proves as fatal on the hills and table-lands of Hunterdon County, N. J., Bucks, Montgomery, Lehigh, and Northampton Counties, Pa., as it does in the dark, damp, illy ventilated stables in New York or Philadelphia. It attacks animals which have been running at pasture, where drainage has been perfect, as well as animals which have been stabled and kept on dry food, regardless of variation in any appreciable sanitary condition. It affects horses of all ages and both sexes; temperament or condition does not alter their susceptibility. Mules are attacked as well as horses, and the mortality is equally as great. There is, however, a variable severity of symptoms and degree of fatality in different outbreaks.

That there is some specific cause which induces this disease is certain, for it is neither contagious nor infectious. Personally, I believe the cause is connected with the food, either developed in it through some fermentative process or upon it in the form of one of the many parasitic fungi which grow on plants, grains, and vegetation. That these, when they are consumed at certain stages of their development, make a poisonous impression upon the brain and ultimately induce structural changes is shown, I think, by the history of the outbreaks wherever they can be traced. In many instances the outbreak of the disease has been simultaneously witnessed where brewers' grains, oats, and hay have been fed, which could be traced from place to place, from one diseased center to another. That they were the carriers, if not the prime factors, can not be denied.

Symptoms.—The symptoms which typify sporadic or epidemic cerebro-spinal meningitis in man are seldom witnessed in equal distinctness among horses, viz: excessive pain, high fever, and early muscular rigidity. In the recognition of the severity of the attack we may divide the symptoms into three grades. In the most rapidly fatal attacks, the animal may first indicate it by weak, staggering gate, partial or total inability to swallow solids or liquids, impairment of eyesight; twitching of the muscles, and slight cramps may be observed. This is soon

followed by a paralysis of the whole body, inability to stand, delirium in which the animal sometimes goes through a series of automatic movements as if trotting or running; the delirium may become very violent and the animal in his unconsciousness bruise his head in his struggles very seriously, but usually a deep coma renders him quiet until he expires. Death in these cases usually takes place in from four to twenty-four hours from the time the first symptoms became manifest. The pulse is variable during the progress of the disease; it may be almost imperceptible at times, and then again very rapid and irregular; the respirations generally are quick and catching. When attacked in this rapidly fatal form we may be able only to distinguish it from encephalitis when other animals in the same stable or neighborhood are similarly affected. In the next form in which it may develop, it first becomes manifest by a difficulty in swallowing and slowness in mastication, and a weakness which may be first noticed in the strength of the tail; the animal will be unable to switch it or to offer resistance when we bend it up over the croup. The pulse is often a little slower than normal. There is no evidence of pain; the respirations are unchanged, and the temperature little less than normal; the bowels may be somewhat constipated. These symptoms may remain unchanged for two or three days and then gradual improvement take place, or the power to swallow may become entirely lost and the weakness and uncertainty in gait more and more perceptible; then sleepiness or coma may appear; the pulse becomes depressed, slow and weak, the breathing sterterous, and paroxysms of delirium develop, with inability to stand, and some rigidity of the spinal muscles or partial cramp of the neck and jaws. In such cases death may occur in from six to ten days from the commencement of the attack. In many cases there is no evidence of pain, spasm, or fever at any time during the progress of the disease, and finally profound coma develops and death follows, painless and without a struggle.

In the last or mildest form, the inability of voluntary control of the limbs becomes but slightly marked, the power of swallowing never entirely lost, and the animal has no fever, pain, or unconscious movements. Generally the animal will begin to improve about the fourth day and recover.

In a few cases the spinal symptoms, manifested by paraplegia, may be the most prominent symptoms; in others they may be altogether absent and the main symptoms be difficulty in mastication and swallowing; rarely it may affect one limb only. In all cases where coma remains absent for six or seven days the animal is likely to recover. When changes toward recovery take place, the symptoms usually leave in the reverse order in which they developed, but local paralysis may remain for some time, rarely persistent.

One attack does not give immunity, for it may recur at some later time and prove fatal. Horses have been known to pass through three attacks, being affected for a week or longer each time.

Treatment.—In the worst class of cases treatment is very seldom successful, and it is dangerous to attempt the administration of medicine by the mouth, on account of the inability of the animal to swallow. Cold shower baths may possibly induce revulsive action in connection with stimulants per rectum, 4 to 6 ounces of whisky in 2 pints of milk; the inhalation of ammonia vapor from a sponge saturated with dilute aqua ammonia may arouse consciousness.

In the second class of cases the treatment recommended by Professor Large consists in giving a cathartic composed of 1 ounce of aloes and the administration of 1 to 2 drams of the solid extract of belladonna, alternated every three hours with 30 drops of tincture of aconite root, and the application of blisters to the neck, spine, and throat. When the animal is unable to swallow, one-fourth-grain doses of sulphate of atropia may be injected under the skin every four, six, or eight hours, as the case may demand. The atropia is a heart stimulant, increases capillary circulation, and quiets pain and excitability. This treatment has been followed by very gratifying results in the hands of Professor Large and others. When the most prominent symptoms abate give such food as they may be able to eat, keep fresh, cool water constantly before them, support them in slings if necessary; clean stabling and plenty of fresh air are of the utmost importance.

Pathology.—*Post mortem* examination reveals more or less congestion of the blood vessels at the base of the brain, effusion in the ventricles and in the subarachnoid space both in the cranial and the spinal cavities. Plastic exudation is often found adherent to the pia mater of the brain, anterior part of the spinal cord, and in the region of the loins. The brain and cord appear softened in some cases where the greatest evidence of inflammatory action existed.

Hygienic measures needful.—Whenever this disease appears in a stable all the animals should be removed as soon as possible. They should be provided with clean, well-ventilated, and well-drained stables, and each animal should receive 1 dram of the extract or half an ounce of the tincture of belladonna twice a day for several days. The abandoned stable should be thoroughly cleansed from all waste matters, receive a coat of whitewash containing 4 ounces of carbolic acid to the gallon, and should have time to dry thoroughly before the horses are replaced. A complete change of food is of the very greatest importance, on account of the belief that the cause resides in diseased grain, hay, and grass.

TETANUS—LOCK-JAW.

This disease is characterized by spasms affecting the muscles of the face, neck, body, and limbs, of all the muscles supplied by the cerebro-spinal nerves. The spasms or muscular contractions are rigid and persistent, yet mixed with occasional more intense contractions of convulsive violence.

Causes.—The causes are classified under two heads, *traumatic* where it is the result of injury, and *idiopathic* where it is due to other causes than injuries, such as cold and damp, excessive fright, nervous exhaustion from overwork, chronic irritation caused by worms in the intestines, etc. In the majority of instances the cause of tetanus can be traced to wounds, especially pricks or wounds of the feet or of tendinous structures. It sometimes follows castration, docking, the introduction of setons, inclusion of a nerve in a ligature, etc. It may come on a long time after the wound is healed, three or four months. In some countries where tetanus appears to be enzoötic the presumption is that it is due to a specific germ. Horses with a nervous, excitable disposition are more predisposed than those of a more sluggish nature. Stallions are more subject to develop tetanus as the result of wounds than geldings, and geldings more than mares.

Symptoms.—The attacks may be acute or subacute. In an acute attack the animal usually dies within four days. The first symptoms which attract the attention of the owner is difficulty in chewing and swallowing, an extension of the head and protrusion over the inner part of the eye of the membrana nictitans or haw. An examination of the mouth will reveal an inability to open the jaws to their full extent, and the endeavor to do so will produce great nervous excitability and increased spasm of the muscles of the jaw and neck. The muscles of the neck and along the spine become rigid and the legs are moved in a stiff manner. The slightest noise or disturbance throws the animal into increased spasm of all the affected muscles. The tail is usually elevated and held immovable; the bowels become constipated early in the attack. The temperature and pulse are not much changed. These symptoms in the acute type become rapidly aggravated until all the muscles are rigid—in a state of tonic spasm—with a continuous tremor running through them; a cold perspiration breaks out on the body; the breathing becomes painful from the spasm of the muscles used in respiration; the jaws are completely set, eye-balls retracted, lips drawn tightly over the teeth, nostrils dilated, and the animal presents a picture of the most extreme agony until death relieves him. The pulse, which at first was not much affected, will become quick and hard, or small and thready when the spasm affects the muscles of the heart. In the subacute cases the jaws may never become entirely locked; the nervous excitability and rigidity of muscles are not so great. There is, however, always some stiffness of the neck or spine manifest in turning; the haw is turned over the eye-ball when the nose is elevated. It is not uncommon for owners to continue such animals at their work for several days after the first symptoms have been observed. All the symptoms may gradually increase in severity for a period of ten days, and then gradually diminish under judicious treatment, or they may reach the stage wherein all the characters of acute tetanus become developed. In some cases, however, we find the muscular cramps almost

solely confined to the head or face, perhaps involving those of the neck. In such cases we have complete *trismus*—lock-jaw—and all the head symptoms are acutely developed. On the contrary, we may find the head almost exempt in some cases, and have the body and limbs perfectly rigid and incapable of movement without falling.

Tetanus may possibly be confounded with spinal meningitis, but the character of the spasm-locked jaw, retraction of the eyeballs, the difficulty in swallowing due to spasms of the muscles of the pharynx, and, above all, the absence of paralysis, should serve to make the distinction.

Treatment.—The animal should be placed in a box-stall without bedding, as far away as possible from other horses. If in a country district, the animal should be put into an outbuilding or shed, where the noise of other animals will not reach him; if the place is moderately dark it is all the better; in fly time he should be covered with a light sheet. The attendant must be very careful and quiet about him, to prevent all unnecessary excitement and increase of spasm.

A cathartic, composed of Barbadoes aloes, 6 to 8 drams, with which may be mixed 2 drams of the solid extract of belladonna, should be given at once. This is best given in a ball form; if, however, the animal is greatly excited by the attempt or can not swallow, the ball may be dissolved in 2 ounces of olive oil and thrown on the back of the tongue with a syringe. If the jaws are set, or nearly so, an attempt to administer medicine by the mouth should not be made. In such cases one-quarter of a grain of atropia, with 5 grains of sulphate of morphia, should be dissolved in 1 dram of pure water and injected under the skin. This should be repeated sufficiently often to keep the animal continually under its effect. This will usually mitigate the severity of the spasmodic contraction of the affected muscles and lessen sensibility to pain. Good results may be obtained sometimes by the injection per rectum of the fluid extract of belladonna and of cannabis indica, of each 1 dram, every four or six hours. This may be diluted with a quart of milk. When the animal is unable to swallow liquids, oat-meal gruel and milk should be given by injection per rectum to sustain the strength of the animal. A pailful of cool water should be constantly before him, placed high enough for him to reach it without special effort; even if he can not drink, the laving of the mouth is refreshing. Excellent success frequently may be obtained by clothing the upper part of the head, the neck, and greater part of the body in woolen blankets kept saturated with very warm water. This treatment should be continued for six or eight hours at a time. It often relaxes the cramped muscles and gives them rest and the animal almost entire freedom from pain; but it should be used every day until the acute spasms have permanently subsided in order to be of any lasting benefit.

If the cause is due to the inclusion of a nerve in a ligature, the division of the nerve becomes necessary. When it is due to a wound all foreign substances should be searched for and be removed; if from a

wound which has healed an excision of the cicatrix may be beneficial. In all cases it is not uncommon to have a partial recovery followed by relapse when the animal becomes excited from any cause.

RABIES—HYDROPHOBIA—MADNESS.

This disease does not arise spontaneously among horses, but is the result of a bite from a rabid animal—generally a dog or cat. The development of the disease follows the bite in from three weeks to three months—very rarely in twelve or fourteen days.

Symptoms.—The first manifestation of the development of this disease may be an increased excitability and viciousness; very slight noises or the approach of a person incites the animal to kick, strike, or bite at any object near him. Very often the horse will bite his own limbs or sides, lacerating the flesh and tearing the skin. The eyes appear staring, bloodshot; the ears are on the alert to catch all sounds; the head is held erect. In some cases the animal will continually rub and bite the locality of the wound inflicted by the rabid animal. This symptom may precede all others. Generally the bowels become constipated and he makes frequent attempts at urination, which is painful and the urine very dark colored. The furious symptoms appear in paroxysms; at other times the animal may eat and drink, although swallowing appears to become painful towards the latter stage of the disease, and may cause renewed paroxysms. The muscles of the limbs or back may be subject to intermittent spasms, or spasmodic tremors; finally the hind limbs become paralyzed, breathing very difficult, and convulsions supervene, followed by death. The pulse and respirations are increased in frequency from the outset of the attack. Rabies may possibly be mistaken for tetanus. In the latter disease we find tonic spasms of the muscles of the jaws, or stiffness of the neck or back very early in the attack, and evidence of viciousness is absent.

Treatment.—As soon as the true nature of the disease is ascertained the animal should be killed.

Prevention.—When a horse is known to have been bitten by a rabid animal immediate cauterization of the wound with a red-hot iron may possibly destroy the virus before absorption of it takes place.

PLUMBISM—LEAD-POISONING.

This disease is not of frequent occurrence. It may be due to habitually drinking water which has been standing in leaden conductors or in old paint barrels, etc. It has been met with in enzoötic form near smelting works, where, by the fumes arising from such works, lead in the form of oxide, carbonate, or sulphate was deposited on the grass and herbage which the horses ate.

Symptoms.—Lead poisoning produces derangement of the functions of digestion and locomotion, or it may affect the lungs principally. In

whatever system of organs the lead is deposited mostly there will we have the symptoms of nervous debility most manifest. If in the lungs the breathing becomes difficult and the animal gets out of breath very quickly when he is compelled to run. Roaring also is very frequently a symptom of lead-poisoning. When it affects the stomach the animal gradually falls away in flesh, the hair becomes rough, the skin tight, and colicky symptoms develop. When the deposit is principally in the muscles partial or complete paralysis gradually develops. When large quantities of lead have been taken in and absorbed, symptoms resembling epilepsy may result, or coma and delirium develop and prove fatal. In lead-poisoning there is seldom any increase in temperature. A blue line forms along the gums of the front teeth, and the breath assumes a peculiar offensive odor. Lead can always be detected in the urine by chemical tests.

Treatment.—The administration of 2-dram doses of iodide of potassa, three times a day. This will form iodide of lead in the system, which is rapidly excreted by the kidneys. If much muscular weakness or paralysis is present, sulphate of iron in dram doses, and strychnia in 2-grain doses may be given twice a day. In all cases of suspected lead-poisoning all utensils which have entered into the supply of feed or water should be examined for the presence of soluble lead. If it occurs near lead works great care must be given to the supply of uncontaminated fodder, etc.

URÆMIA.

Uræmic poisoning may affect the brain in nephritis, acute albuminuria, or when, from any cause, the functions of the kidneys become impaired or suppressed and urea (a natural product) is no longer eliminated from these organs, causing it to accumulate in the system and give rise to uræmic poisoning.

Symptoms.—Uræmic poisoning is usually preceded by dropsy of the limbs or abdomen; a peculiar fetid breath is often noticed; then drowsiness, attacks of diarrhea, and general debility ensue. Suddenly extreme stupor or coma develops; the surface of the body becomes cold; the pupils are insensible to light; the pulse slow and intermitting; the breathing labored, and death supervenes. The temperature throughout the disease is seldom increased. unless the disease becomes complicated with acute inflammatory disease of the brain or respiratory organs, which often occur as a result of the urea in the circulation. Albumen and tube casts may frequently be found in the urine. The disease almost invariably proves fatal.

Treatment.—This must be directed to a removal of the cause. (See "Diseases of the Kidney.")

ELECTRIC SHOCK.

Electric shock, from coming in contact with electric wires, is becoming a matter of rather frequent occurrence, and has a similar effect upon

the animal system to a shock from lightning. Two degrees of electric or lightning shock may be observed, one producing temporary contraction of muscles and insensibility, from which recovery is possible, the other killing directly, by producing a condition of nervous and general insensibility. In shocks which are not immediately fatal the animal is usually insensible, the respiration slow, labored or gasping, the pulse slow, feeble, and irregular, and the pupils dilated and not sensitive, or they may be contracted and sensitive. The temperature is lowered. There may be a tendency to convulsions or spasms. The predominating symptoms are extreme cardiac and respiratory depression.

Treatment.—Sulphate of atropia should be given hypodermically in one quarter grain doses every hour or two hours until the heart beats are invigorated, the number and fullness of the respirations increased, and consciousness returns. Stimulating injections per rectum may also be useful in arousing the circulation; for this purpose whisky or ammonia water may be used.

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THE NERVOUS SYSTEM.

DISEASES OF THE HEART AND BLOOD-VESSELS.

By M. R. TRUMBOWER, V. S., Sterling, Ill.

REMARKS ON THE ANATOMY AND PHYSIOLOGY OF THE HEART AND BLOOD-VESSELS.

The heart is a hollow, involuntary, muscular organ, situated as nearly as possible in the center of the chest, though its impulse is felt on the left side from the rotary movement of the organ in action. It is cone-shaped, with the base upwards; the apex points downwards, backwards, and to the left side. It extends from about the third to the sixth ribs inclusive. The average weight is about 6½ pounds. In horses used for speed the heart is relatively larger, according to the weight of the animal, than in horses used for slow work. It is suspended from the spine by the large blood-vessels, and held in position below by the attachment of the pericardium to the sternum. It is inclosed in a sac, the pericardium, which is composed of a dense, fibrous, membrane, lined by a delicate serous membrane, which is reflected over the heart; the inner layer is firmly adherent to the heart, the outer to the fibrous sac, and there is an intervening space known as the pericardial space, in which a small amount of serum—a thin translucent liquid—is present constantly.

The heart is divided by a shallow fissure into a right and left side; each of these is again subdivided by a transverse partition into two compartments, which communicate. Thus there are four cardiac cavities, the superior or upper ones called the auricles, the inferior or lower ones the ventricles. These divisions are marked on the outside by grooves, which contain the cardiac blood-vessels, and are generally filled with fat.

The right side of the heart may be called the venous, the left the arterial side, named from the kind of blood which passes through them. The auricles are thin-walled cavities placed at the base, and are connected with the great veins, the vena cavæ and pulmonary veins, through which they receive blood from all parts of the body. The auricles communicate with the ventricles each by a large aperture, the *auriculo-ventricular* orifice, which is furnished with a remarkable mechanism of

valves, allowing the transmission of blood from the auricles into the ventricles, but preventing a reverse course. The ventricles are thick-walled cavities, forming the more massive portion of the heart towards the apex. They are separated by a partition, and are connected with the great arteries, the pulmonary artery and the aorta, by which they send blood to all parts of the body. At the mouth of the aorta and at the mouth of the pulmonary artery is an arrangement of valves in each case which prevents the reflux of blood into the ventricles. The *auriculo-ventricular* valves in the left side are composed of two flaps, hence it is called the *bicuspid valve.* In the right side this valve has three flaps, and is called the *tricuspid valve.* The flaps which form these valves are connected with a tendinous ring between the auricles and ventricles; and each flap of the *auriculo-ventricular* valves is supplied with tendinous cords, which are attached to the free margin and under surface, so as to keep the valves tense when closed; a condition which is produced by the shortening of muscular pillars with which the cords are connected. The arterial openings, both on the right and on the left side, are provided with three-flapped semi-lunar shaped valves, to prevent the regurgitation of blood when the ventricles contract. The veins emptying into the auricles are not capable of closure, but the posterior vena cava has an imperfect valve at its aperture.

The inner surface of the heart is lined by a serous membrane, the endocardium, which is smooth and firmly adherent to the muscular structure of the heart. This membrane is continuous with the lining membrane of the blood vessels, and it enters into the formation of the valves.

The circulation through the heart is as follows: The venous blood is carried into the right auricle by the anterior and posterior venæ cavæ. It then passes through the right *auriculo-ventricular* opening into the right ventricle, thence through the pulmonary artery to the lungs. It returns by the pulmonary veins to the left auricle, then is forced through the *auriculo-ventricular* opening into the left ventricle, which propels it through the aorta and its branches into the system, the veins returning it again to the heart. The circulation, therefore, is double, the pulmonary or lesser being performed by the right, and the systemic or greater by the left side.

As the blood is forced through the heart by forcible contractions of its muscular walls it has the action of a force pump, and gives the impulse at each beat, which we call the pulse—the dilatation of the arteries throughout the system. The contraction of the auricles is quickly followed by that of the ventricles, and then a slight pause occurs; this takes place in regular rythmical order during health.

The action of the heart is governed and maintained by the pneumo-gastric nerve (tenth pair of cranial nerves); it is the inhibitory nerve of the heart, and regulates, slows, and governs its action. When the nerve is cut the heart-beats increase rapidly, and in fact the organ works without

control. When the nerve is unduly irritated the hold-back or inhibitory force is increased, and the heart slows up in the same measure. The left cavities of the heart, the pulmonary veins, and the aorta or systemic artery, contain red or florid blood, fit to circulate through the body. The right cavities of the heart, with the venæ cavæ or systemic veins and pulmonary artery, contain dark blood, which must be transmitted through the lungs for renovation.

The arteries, commencing in two great trunks, the aorta and the pulmonary artery, undergo division as in the branching of a tree. Their branches mostly come off at acute angles, and are commonly of uniform diameter in each case, but successively diminish after and in consequence of division, and in this manner gradually merge into the capillary system of blood-vessels. As a general rule, the combined area of the branches is greater than that of the vessels from which they emanate, and hence the collective capacity of the arterial system is greatest at the capillary vessels. The same rule applies to the veins. The effect of the division of the arteries is to make the blood move more slowly along their branches to the capillary vessels, and the effect of the union of the branches of the veins is to accelerate the speed of the blood as it returns from the capillary vessels to the venous trunks.

In the smaller vessels a frequent running together or *anastomosis* occurs. This admits of a free communication between the currents of blood, and must tend to promote equability of distribution and of pressure, and to obviate the effects of local interruption. The arteries are highly elastic, being extensile and retractile both in length and breadth. During life they are also contractile, being provided with muscular tissue. When cut across they present, although empty, an open orifice; the veins, on the other hand, collapse.

In most parts of the body the arteries are inclosed in a sheath formed of connective tissue, but are connected so loosely that when the vessel is cut across its ends readily retract some distance within the sheath. Independently of this sheath arteries are usually described as being formed of three coats, named, from their relative positions, *external*, *middle*, and *internal*. This applies to their structure so far as it is discernable by the naked eye. The internal, serous or *tunica intima* is the thinnest, and continuous with the lining membrane of the heart. It is made up of two layers, an inner, consisting of a layer of epithelial scales, and an outer, transparent, whitish, highly elastic, and perforated. The middle coat, *tunica media*, is elastic, dense, and of a yellow color, consisting of non-striated muscular and elastic fibers, thickest in the largest arteries and becoming thinner in the smaller. In the smallest vessels it is almost entirely muscular. The external coat, *tunica adventitia*, is composed mainly of fine and closely-woven bundles of white connective tissue, which chiefly run diagonally or obliquely round the vessel. In this coat the nutrient vessels, the *vasa vasorum*, form a capillary net-work, from which a few penetrate as far as the muscular coat.

The veins differ from arteries in possessing thinner walls, less elastic and muscular tissue, and for the most part a stronger *tunica adventitia*. They collapse when cut across or when they are empty. The majority of veins are provided with valves; these are folds of the lining membrane, strengthened by fibrous tissue. They favor the course of the blood and prevent its reflux. The nerves which supply both the arteries and the veins come from the sympathetic system. The smaller arteries terminate in the system of minute vessels, known as the capillaries, which are interposed between the termination of the arteries and the commencement of the veins. Their average diameter is about one three-thousandth of an inch.

SOUNDS OF THE HEART.

By placing the ear behind the elbow against the left side of the chest two distinct sounds can be heard at each heart-beat in health. The first is rather muffled and prolonged, the second is short and sudden. The first is caused by the contraction of the ventricles, the closing of the *auriculo-ventricular* valves, and the forcible propulsion of the blood into the arteries; the second follows immediately, and is due to the reflux of the blood just forced into the arteries, and the sudden closure of the valves which prevent its return to the heart. In disease of the heart or valves these sounds are generally modified, or supplanted by others, which vary so much in character and are so difficult to describe that we can not consider them here; long and extensive experience is required to distinguish them practically.

CHARACTERS OF THE PULSE.

The circulation of the blood through the heart is constant, and is maintained by the propelling activity of this organ. In the horse the heart beats from thirty-six to forty-six times a minute, varying with the disposition, breed, and temperament of the animal. In the foal the pulse is about three times as rapid as in the adult, from six months to a year about twice as quick, and in the two-year-old about one-quarter faster. The pulse is usually taken at the angle of the jaw, where the artery crosses the bone, and its force or character is often indicative of the nature of the disease from which an animal may be suffering. The pulse, therefore, is named in accordance with its character as slow, soft, small, full, weak, quick, hard, irregular, intermittent, venous, etc.

Slow pulse is one where the number of beats are less than normal, and is often found in certain diseases of the brain.

Soft or *compressible pulse* is one where the beat is rather weak, but not abnormally rapid. It is often found in debility due to want of assimilation or proper nourishment. When accompanied with fever or loss of appetite it is usually indicative of deraugement of the digestive organs.

Small pulse is one where the sensation conveyed to the finger is one of lessened diameter of the artery; it may be normal in frequency or slightly increased. Generally due to exhaustion from work or disease.

Full or *strong pulse* is one which imparts a bounding sensation as if from over-distention of the artery at each heart-beat. It is usually increased in frequency. This character may be felt immediately succeeding fast work, or in very plethoric horses when slightly excited. Often it may indicate a general systemic disturbance or disease of the lungs.

Weak or *feeble pulse* is one which is hardly perceptible. This may indicate organic disease of the heart, or denote general weakness from loss of blood, prolonged sickness, starvation, etc.

Quick or *frequent pulse* is one where the heart-beats are more rapid than normal, without any special change in its character. It is found in the early stage of nearly all inflammatory diseases.

Hard or *wiry pulse* is one which is tense, incompressible, or vibrating, and is always increased in frequency. It usually denotes acute disease of serous membranes, such as pleuritis, peritonitis, meningitis, etc.

Irregular pulse is one in which several pulsations follow in quick succession and then a pause ensues. This may indicate disease of the heart, or of the nervous system, sometimes observed in lingering, exhausting diseases.

Intermittent pulse is one where a beat is lost at regular intervals. This is almost invariably an indication of disease of the heart.

Venous pulse may be seen along the side of the neck in the jugular furrow, and has the appearance of blood regurgitating in the vein at each beat of the heart. It usually denotes disease of the heart, or an obstruction to the flow of blood within the chest, from the pressure of a tumor, dropsy, etc.

DISEASES OF THE HEART AND BLOOD-VESSELS.

In considering diseases of the heart we meet with many difficulties, depending much upon the position which this organ occupies in the animal. The shoulders cover so much of the anterior portion of the chest, and often in very heavy muscled horses the chest walls are so thick, that a satisfactory examination of the heart cannot be made. Diseases of the heart are not uncommon among horses; the heart and its membranes are frequently involved in diseases of the respiratory organs, diseases of the kidneys, rheumatism, influenza, etc. Some of the diseases of this organ are never suspected by the ordinary observer during life, and are so difficult to diagnose with any degree of certainty that we will have to confine ourselves to a general outline, giving attention to such symptoms as may serve to lead to a knowledge of their existence, with directions for treatment, care, etc.

Nervous affections often produce prominent heart symptoms by causing functional disturbance of that organ, which, if removed, will leave

the heart restored to perfect vigor and normal action. Organic changes involving the heart or valves, however, usually grow worse and eventually prove fatal. Therefore it is necessary that we arrive at an appreciation of the true nature and causes, so that we may be able to form a true estimate of the possibilities for recovery or encouragement for medical treatment.

Disease of the heart may occur at any age, but it is witnessed most frequently in young horses, which, when being trained for fast work, are often subjected to excessive hardship and fatigue. Nervous or timid animals also suffer from such diseases more frequently than those of a sluggish disposition. Any cause which induces a violent or sudden change in the circulation may result in injury to the heart. Symptoms which may frequently denote disease of the heart are difficult breathing or short-windedness, dropsies of the limbs, habitual coldness of the extremities, giddiness or fainting attacks, inability to stand work although the general appearance would indicate strength and ability, etc.

INFLAMMATORY DISEASES OF THE HEART.

This will embrace myocarditis, endocarditis, and pericarditis.

MYOCARDITIS—INFLAMMATION OF THE MUSCULAR STRUCTURE OF THE HEART.

This is of rare occurrence without implication of the endocardium or pericardium. That inflammation of the muscular walls of the heart may frequently exist to some slight degree, induced by excessive action, can not be doubted. *Post-mortem* examinations occasionally reveal abscess and degeneration within the walls of this organ, which were not suspected during life. Myocarditis primarily involves the interstitial muscular tissue and the blood vessels, and presents itself in a sub-acute or chronic type, which often leads to induration or hypertrophy, occasionally to the formation of pus and abscess. It may also lead to a dilatation of the heart and rupture.

Causes.—Over-exertion or heart strain, influenza, rheumatism, pyæmia, extension of endocarditis or pericarditis, etc. Myocarditis usually involves the endocardial membrane very early in the attack, and develops all the symptoms of endocarditis. Hence we will consider, as most distinctive of inflammation of the heart, endocarditis.

ENDOCARDITIS—INFLAMMATION OF THE LINING MEMBRANE OF THE HEART, USUALLY INVOLVING THE MUSCULAR STRUCTURE.

It is frequently found in general rheumatism, involving the serous membrane, some of the specific or zymotic fevers, septic poisoning, etc. Endocarditis is a much more frequent disease among horses than we are generally aware, and often gives rise to symptoms which, at first, are obscure and unnoticed. I have witnessed two enzoötics of influenza in which 20 per cent. of the animals attacked developed symptoms of

either endocarditis or pericarditis. A certain number of these cases subsequently developed the condition known as heaves, or gradually failed in strength, with recurrence of attacks of heart failure upon the slightest exertion, rendering many of them valueless. In the rheumatic type of influenza we may often find the heart becoming involved in the disease, in consequence of the morbid material conveyed through the heart in the blood-stream. In view of the fact that many affections, in even remote portions of the body, may be traced directly to a primary endocardial disease, we shall feel justified in inviting special attention to this disease.

Endocarditis may be acute or assume various degrees of severity. In acute inflammation we find a thickening and a roughened appearance of the endocardium throughout the cavities of the heart. This condition is soon followed by a coagulation of fibrine upon the inflamed surface, which adheres to it, and by attrition soon becomes worked up into shreddy-like granular elevations; this may lead to the formation of fibrinous clots in the heart and sudden death early in the disease, the second or third day. This acute type of the disease, however, does not always affect the whole interior of the heart, but is often confined to one ventricle or may be in patches; it may extend through the ventricle into the aorta or the pulmonary vein; it may affect the valves principally, which are composed of but little else than the endocardium folded upon itself.

In acute endocarditis we invariably will find myocarditis develop corresponding to the same space, which in intensity may produce serious results through the destruction of functional ability or lead to weakness, abscess, or rupture. Immediately upon the swelling of this membrane we will find an abnormal action and abnormal sounds of the heart.

Subacute endocarditis, which is the most common form we meet, may not become appreciable for several days after its commencement. It is characterized by being confined to one or more anatomical divisions of the heart, and all the successive morbid changes follow each other in a comparatively slow process. Often we would not be led to suspect heart affection were it not for the distress in breathing, which it generally occasions when the animal is exercised, especially if the valves are much involved. When the disease extends into the arteries, atheromatous deposits usually develop; when the inflammation is severe at the origin of the tendinous cords they may become softened and ruptured. When much fibrinous coagula or cellular vegetations form upon the inflamed membrane, either in minute shreds or patches, or when formation of fibrinous clots occurs in the cavity affected, some of these materials may be carried from the cavity of the heart by the blood-current into remote organs, constituting emboli that are liable to suddenly plug vessels and thereby interrupt important functions. In the great majority of either acute or subacute grades of endocarditis, whatever the

exciting cause, the most alarming symptoms disappear in a week or ten days, often leaving, however, such changes in the interior lining or valvular structures as to cause impairment in the circulation for a much longer period of time. These changes usually consist of thickening or induration of the inflamed structures. But while the effects of the inflammation in the membrane lining the walls of the ventricles may subside to such a degree as to cause little or no inconvenience, or even wholly disappear, yet after the valvular structures have been involved, causing them to be thicker, less flexible than normal, they usually remain, obstructing the free passage of the blood through the openings of the heart, thereby inducing secondary changes which take place slowly at first, but ultimately seriously impair the animal's usefulness. What was but a slight obstruction to the circulation during the first few weeks after the subsidence of the cardiac inflammatory attack becomes in process of time so much increased as to induce increased growth in the muscular structure of the heart, constituting hypertrophy of the walls of the ventricles, more particularly of the left, with corresponding fullness of the left auricle and pulmonary veins, thereby producing fullness of the capillaries in the lungs, pressure upon the air cells, difficult or asthmatic breathing—greatly increased in attempts to work—until in a few months many of these cases become entirely disabled for work. Sometimes, too, dropsical effusions in the limbs or into the cavities of the body result from the irregular and deficient circulation. Derangement of the urinary secretion, with passive congestion of the kidneys, may also appear.

Endocardial inflammation is seldom fatal in its early stages, but in many cases the recovery is incomplete, for a large proportion are left with some permanent thickening of the valves, which constitute the beginning of valvular disease.

Symptoms.—As already stated, myocarditis is seldom recognized until pericarditis or endocarditis supervenes. Staggering gait with painful movement of the fore-limbs, a constant irregularity of the heart's action, but equality of strength regardless of the rapidity of the heart-beats, constitute perhaps the most prominent symptoms which characterize myocarditis. When the disease is associated with rheumatism, influenza, or other zymotic diseases, these symptoms may not be sufficiently well defined to attract the attention they deserve, and medical treatment prescribed for the mitigation of such disease often serves to aggravate the cardiac affection. In chronic myocarditis we generally find a persistent palpitation with irregularity of beat, which, upon exercise, becomes greatly intensified. Change in the sounds of the heart do not occur unless pericarditis, endocarditis, or disease of the valves are associated with myocarditis. When it leads to hypertrophy we may find an abnormally increased area of dullness on percussion. In endocarditis, when the attack is sudden and severe, we may find many of the symptoms which characterize pericarditis and pleuritis, but a close examination will reveal notable differences.

Endocarditis may be ushered in by a chill, with sudden and marked rise in temperature. The pulse rapidly decreases in strength or may become irregular, while the heart beats more or less tumultuously. In the early stages soft blowing sounds may be heard by placing the ear over the heart on the left side, which correspond in number and rhythm to the heart's action. Excessive pain, though not so great as in acute pleuritis, is manifested when the animal is compelled to trot; very often difficulty in breathing—shortness of breath—on the slightest exertion develops early in the attack. When the valves are involved in the inflammatory process the visible mucous membranes become either very pale or very dark colored, and fainting may occur when the head is suddenly elevated. When the valves of the right side are affected we may have a regurgitant pulsation in the jugular vein. In some cases we find marked lameness of the left shoulder, and when the animal is turned short to the left side he may groan with pain, and the heart's action become violently excited, although pressure against the chest-wall will not produce pain unless roughly applied. The animal is not disposed to eat or drink much; the surface of the body and legs are cold—rarely excessively hot—and frequently the body of the animal is in a subdued tremor. In nearly all cases there is partial suppression of the urinary secretion. The symptoms may continue with very little modification for three or four days, sometimes seven days, without any marked changes. If fibrinous clots form in the heart the change will be sudden and quickly prove fatal unless they become loosened and are carried away in the circulation; then apoplexy may result from the plugging of arteries too small to give further transmission. If the animal manifests symptoms of improvement, the changes usually are slow and steady until he feels apparently as well as ever, eats well, and moves freely in his stall or yard. When he is taken out, however, the seeming strength often proves deceptive, as he may quickly weaken if urged into a fast gait, the breathing become quickened with a double flank movement as in heaves, and all the former symptoms reappear in a modified degree. An examination at this stage may reveal valvular insufficiency, cardiac hypertrophy, or pulmonary engorgement.

In fatal cases of endocarditis death often occurs about the fourth day, from the formation of heart clot or too great embarrassment of the circulation. Endocarditis may be suspected in all cases where plain symptoms of cardiac affection are manifested in animals affected with influenza, rheumatism, or any disease in which the blood may convey septic matter.

Acute endocardial inflammation may be distinguished from pleuritis by the absence of any friction murmer, absence of pain when the chest wall is percussed, and the absence of effusion in the cavity of the chest. It may be distinguished from pericarditis by the absence of the friction sounds and want of an enlarged area of dullness on percussion.

Treatment.—The treatment will be similar in both myocarditis and

endocarditis. The objects to be attained will be to remove or mitigate as much as possible the cause inducing the disease; to find a medicine which will lessen the irritability of the heart without weakening it; and last, to maintain a free urinary secretion and prevent exudation and hypertrophy. So long as there is an increase of temperature, with some degree of scantiness of the urine, it may be safe to believe that there is some degree of inflammatory action existing in the cardiac structures, and, as long as any evidence of inflammatory action remains, however moderate in degree, there is a tendency to increase or hypertrophy of the connective tissue of the heart or valves, thereby rendering it almost certain that the structural changes will become permanent unless counteracted by persistent treatment and complete rest.

The tincture of digitalis, in 20-drop doses, repeated every hour, is perhaps the most reliable agent we know to control the irritability of the heart, and this also has a decided influence upon the urinary secretion. After the desired impression upon the heart is obtained the dose may be repeated every two or three hours, or as the case may demand. Fluid extract of *convallaria majalis*, in 2-dram doses, will quiet the tumultuous action of the heart in some cases where the digitalis fails. Some veterinarians recommend bleeding, others cold packs around the chest or over the heart. The former is decidedly objectionable, because of its tendency to favor fibrinous exudation and clot formation; the latter is too risky a proceeding in the majority of cases to warrant its use, for we find this disease in wet and damp stables in the most aggravated and fatal forms. Blistering and stimulating applications to the chest should also be avoided. They serve to irritate the animal and can do no possible good. Chlorate of potassa, in 2-dram doses, may be given in the drinking water every four hours for the first five or six days, and then be superceded by the nitrate of potassa, in half-ounce doses, for the following week, or until the urinary secretion becomes abnormally profuse. Where the disease is associated with rheumatism 2-dram doses of salicylate of soda may be substituted for the chlorate of potassa. To guard against chronic induration of the valves the iodide of potassa, in one to 2-dram doses, should be given early in the disease, and may be repeated two or three times a day for several weeks. When chronic effects remain after the acute stage has passed this drug becomes indispensable.

When dropsy of the limbs develops, it is due to weakened circulation or functional impairment of the kidneys. When there is much weakness in the action of the heart, or general debility is marked, the iodide of iron, in 1 dram doses, combined with hydrastis, 3 drams, may be given three times a day. Arsenic, in 5-grain doses twice a day, will give excellent results in some cases of weak heart associated with difficult breathing. In all cases absolute rest and warm stabling, with comfortable clothing, becomes necessary, and freedom from work should be allowed for a long time after all symptoms have disappeared.

ABSCESS IN THE HEART.

This is a result of myocarditis, or it may arise from localized pyæmic infection or embolism of a coronary vessel, causing disintegration and death of a part. Such abscess may be single and large, or multiple and small. They may weaken the heart sufficiently to cause rupture of its walls, or may embarrass the circulation by pressure upon the orifices or cavities sufficient to produce death.

Abscess of the heart cannot be diagnosed with any degree of certainty.

PERICARDITIS—INFLAMMATION OF THE SAC INCLOSING THE HEART.

Causes.—Pericarditis may be induced by cold and damp stabling, exposure and fatigue, from wounds caused by broken ribs, etc. Generally, however, it is associated with an attack of influenza, rheumatism, pleuritis, etc.

Symptoms.—Usually the disease manifests itself abruptly by a brief stage of chills coincident with pain in moving, a short painful cough, rapid and short breathing, and high temperature, with a rapid and hard pulse. The fever is highest, with corresponding pulse, in the evening and lowest in the morning. In the early stages of the disease the pulse is regular in beat; later, when there is much exudation present in the pericardial sac, the heart-beat becomes muffled, and may be of a doubled or rebounding character. By placing the ear against the left side of the chest behind the elbow a rasping sound may be heard, corresponding to the frequency of the heart-beat. This is known as the to-and-fro friction sound. Between the second and fourth days this sound may disappear, due to a distention of the pericardium by an exudate or serious effusion. As soon as this effusion partly fills the pericardium, percussion will reveal an abnormally increased area of dullness over the region of the heart, the heartbeats become less perceptible than in health, and in some cases a splashing or flapping sound may become audible.

If the effusion becomes absorbed, the to-and-fro friction sound usually recurs for a short time; this friction may often be felt by applying the hand to the side of the chest. In a few cases clonic spasms of the muscles of the neck may be present. In acute pericarditis, when the effusion is rapid and excessive, the animal may die in a few days, or recovery may begin equally as early. In subacute or in chronic cases the effusion may slowly become augmented until the pressure upon the lungs and interference with the circulation becomes so great that death will result. Whether the attack is acute, subacute, or chronic, the characteristic symptoms which will guide us to a correct diagnosis are the to-and-fro friction sound, which is always synchronous with the heart's action, the high temperature with hard, irritable pulse, and in cases of pericardial effusion the increased area of dullness over the cardiac

region. When the disease is associated with influenza or rheumatism some of the symptoms may be obscure, but a careful examination will reveal sufficient upon which to base a diagnosis. When pericarditis develops as a result of or in connection with pleuritis, the distinction may not be very clearly definable, neither will many recover. When it results from a wound or broken rib it almost invariably proves fatal.

Pathology.—Pericarditis may at all times be regarded as a very serious affection. At first we will find an intense injection or accumulation of blood in the vessels of the pericardium, giving it a red and swollen appearance, during which we have the friction sound. In twenty-four or forty-eight hours this engorgement is followed by an exudation of sero-fibrinous fluid, the fibrinous portion of which may soon form a coating over the internal surface of the pericardial sac, and may ultimately form a union of the opposing surfaces. Generally this adhesion will only be found to occupy a portion of the surfaces. As the serous or watery portion of this effusion is absorbed, the distinctness of the friction sound recurs, and may remain peceptible in varied degree for a long time. When the serous effusion is very great, the pressure exerted upon the heart weakens its action, and may produce death soon; when it is not so great, it may cause dropsies of other portions of the body. When the adhesions of the pericardial sac to the body of the heart are extensive, they generally lead to increased growth or hypertrophy of the heart, with or without dilatation of its cavities; when they are but slight, they may not cause any inconvenience.

Treatment.—In acute or subacute pericarditis the tincture of digitalis and tincture of aconite root may be mixed, taking equal quantities, and give 20 to 30 drop doses every hour until the pulse and temperature become reduced. Bandages should be applied to the legs; if they are very cold, tincture of capsicum should be first applied; the body should be warmly clothed in blankets, to promote perspiration. When the suffering from pain is very severe, 2 ounces of tincture of opium may be given once or twice a day; nitrate of potassa, half an ounce, in drinking water, every six hours; after the third day, iodide of potassa, in 2-dram doses, may be substituted. Hot packs to the chest in the early stages of the disease may give marked relief, or smart blisters may be applied to the sides of the chest with benefit. If the disease becomes chronic, iodide of iron and gentian to support the strength will be indicated, but the iodide of potassa, in one or 2-dram doses, two or three times a day, must not be abandoned so long as there is an evidence of effusion or plastic exudate accumulating in the pericardial sac. Where the effusion is great and threatens the life of the patient, tapping, by an expert veterinarian, may save the animal.

VALVULAR DISEASE OF THE HEART.

Acute valvular disease can not be distinguished from endocarditis, and chronic valvular affections are generally the result of endocardial inflammation. The valves of the left side are the most subject—the

bicuspid or mitral, and the aortic or semilunar. It may consist of mere inflammation and swelling, or the edges of the valves may become agglutinated by the organization of the exudation, thus narrowing the passage. Valvular obstruction and adhesions may occur, or the tendinous cords may be lengthened or shortened, thus obstructing the orifices and permitting the regurgitation of blood. In protracted cases the fibrous tissue of the valves may be transformed into fibro-cartilage or bone, or there may be deposits of salts of lime beneath the serous membrane, which may terminate in ulceration, rupture, or fissures. Sometimes the valves become covered by fibrinous, fleshy, or cartilaginous vegetations or excrescences. In cases of considerable dilatation of the heart there may be atrophy and shrinking of the valves.

Symptoms.—Valvular disease may be indicated by a venous pulse, jerking pulse, intermittent pulse, irregular pulse; palpitation; constant abnormal fullness of the jugular veins; difficulty of breathing when the animal becomes excited, or is urged out of a walk or into a fast trot; attacks of vertigo; congestion of the brain; dropsical swelling of the limbs. A blowing, cooing, or bubbling murmur may sometimes be heard by placing the ear over the heart on the left side of the chest.

Hypertrophy, or dilatation, or both, usually follows valvular disease.

Treatment.—When the pulse is irregular, or irritable, tonics, such as preparations of iron, gentian, and ginger may be given. When the action of the heart is jerking or violent, 20 to 30 drop doses of tincture of digitalis or of veratrum viride may be given until these symptoms abate. As the disease nearly always is the result of endocarditis, the iodide of potassa and general tonics, sometimes stimulants, when general debility supervenes, may be of temporary benefit. Very few animals recover, or remain useful for any length of time, after once marked organic changes have taken place in the valvular structure of the heart.

ADVENTITIOUS GROWTHS IN THE HEART.

Fibrous, *cartilaginous*, and *bony* formations have been observed in some rare instances, in the muscular tissue. Isolated calcareous masses have sometimes been imbedded in the cardiac walls. *Fibrinous coagula* and *polypous concretions* may be found in the cavities of the heart. The former consist of coagulated fibrin, separated from the mass of blood, of a whitish or yellowish white color, translucent, of a jelly-like consistence, and having a nucleus in the center. They may slightly adhere to the surface of the cavity, from which they can easily be separated without altering the structure of the endocardium. They probably result from an excess of coagulability of fibrin, which is produced by an organization of the lymph during exudation. They are usually found in the right auricle and ventricle.

Polypous concretions are firmer than the preceding, more opaque, of a fibrous texture, and may be composed of successive layers. In some instances they are exceedingly minute, while in others they almost fill

one or more of the cavities. Their color is usually white, but occasionally red from the presence of blood. They firmly adhere to the endocardium, and when detached from it give it a torn appearance. Occasionally, a vascular communication seems to exist between them and the substance of the heart. They may be the result of fibrinous exudation from inflammation of the inner surface of the heart, or the coagulation of a portion of the blood which afterwards contracts adhesion with the heart. These concretions prove a source of great inconvenience, and often danger, no matter how formed. They cause a diminution in the cavity in which they are found, thus narrowing the orifice through which the blood passes, or preventing a proper coaptation of the valves, which may produce most serious valvular disease.

Symptoms.—These are frequently uncertain; they may, however, be suspected when the action of the heart suddenly becomes embarrassed with irregular and confused pulsations, great difficulty of breathing, and the usual signs dependent upon the imperfect arterialization of the blood.

Treatment.—Stimulants, whisky, or carbonate of ammonia, may be of service.

FUNCTIONAL AND ORGANIC DISEASES OF THE HEART.

The distinction between functional and organic diseases of the heart is not easily made. We may accept as a guide that the character of organic diseases of the heart is to progress, and that of functional to occur at regular intervals. Active exercise almost invariably aggravates organic, but seldom increases the symptoms of functional disease, and that the physical signs generally are soon developed, and remain permanent in organic, while they seldom exist in functional.

PALPITATION OF THE HEART.

This is a tumultuous and usually irregular beating of the heart. It may be due to a variety of causes, both functional and organic. We will, however, exclude the organic causes which lead to irregular action, and give it a more simple specification. It may occur as a result of indigestion, fright, increased nervousness, sudden excitement, excessive speeding, etc. (See "Thumps.")

Symptoms.—The heart may act with such violence that each beat may jar the whole body of the animal, very commonly it may be heard at a short distance away from the animal. It can, usually, be traced very readily to the exciting cause, which we may be able to avoid or overcome in the future and thereby obviate subsequent attacks. Rest, a mild stimulant, or a dose or two of tincture of digitalis or opium, will generally give prompt relief. When it is due to organic impairment of the heart it must be regarded as a symptom, not as a matter for primary specific treatment.

SYNCOPE—FAINTING.

Actual fainting rarely occurs among horses. It may, however, be induced by a rapid and great loss of blood, pain of great intensity, a mechanical interference with the circulation of the brain, etc.

Symptoms.—Syncope is characterized by a decrease or temporary suspension of the action of the heart and respiration, with partial or total loss of consciousness. It generally occurs suddenly, though there may be premonitory symptoms, as giddiness or vertigo, dilated pupil, staggering, blanching of the visible mucous membranes, a rapidly sinking pulse, and dropping to the ground. The pulse is feeble or ceases to beat; the surface of the body turns cold; breathing is scarcely to be perceived, and the animal may be entirely unconscious. This state is uncertain in duration; generally it lasts only a few minutes; the circulation becomes restored, breathing becomes more distinct, and consciousness and muscular strength return. In cases attended with much hemorrhage or organic disease of the heart, the fainting fit may be fatal, otherwise it will prove but a transient occurrence. In paralysis of the heart the symptoms may be exactly similar to syncope. Syncope may be distinguished from apoplexy by the absence of stertorous breathing, and lividity of the visible mucous membranes.

Treatment.—Dash cold water on the head; administer a stimulant, 4 ounces of whisky or half an ounce of carbonate of ammonia. Prevent the animal from getting up too soon, or the attack may immediately recur. Afterwards, if the attack was due to weakness from loss of blood, impoverished blood, or associated with debility, general tonics, rest, and nourishing food are indicated.

HYPERTROPHY OF THE HEART—CARDIAC ENLARGEMENT.

Hypertrophy of the heart implies augmentation of bulk in its muscular substance, with or without dilatation or contraction of its cavities. It may exist with or without other cardiac affections. In valvular disease or valvular insufficiency hypertrophy frequently results as a consequence of increased demand for propelling power. The difficulties with which it is most frequently connected are dilatation and ossification of the valves. It may also occur in connection with atrophied kidneys, weak heart, etc. It may be caused by an increased determination of blood to the organ, or from a latent form of myocarditis, and it may arise from a long-continued increase of action dependent upon nervous disease. All the cavities of the heart may have their walls hypertrophied or the thickening may involve one or more. While the wall of a ventricle is thickened its cavity may retain its normal size—*simple hypertrophy*—or be dilated—*eccentric hypertrophy*—or it may be contracted—*concentric hypertrophy.* Hypertrophy of both ventricles increases the length and breadth of the heart. Hypertrophy of the left ventricle alone increases its length, of the right ventricle alone in-

creases its breadth toward the right side. Hypertrophy with dilatation may affect the chambers of the heart conjointly or separately. This form is by far the most frequent variety of cardiac enlargement. When the entire heart is affected it assumes a globular appearance, the apex being almost obliterated, and situated transversely in the chest. The bulk may become three or four times greater than the average size of heart.

Symptoms.—In hypertrophy of the heart, in addition to the usual symptoms manifested in organic diseases of the heart, there is a powerful and heaving impulse at each beat, which may be felt on the left side, often also on the right. These pulsations are regular, and when full and strong at the jaw there is a tendency to active congestion of the capillary vessels, which frequently gives rise to local inflammation, active hæmorrhage, etc. If the pulse is small and feeble at the jaw we may conclude that there is some obstacle to the escape of the blood from the left ventricle into the aorta, which has given rise to the hypertrophy. In case of hypertrophy with dilatation, the impulse is not only powerful and heaving, but it is diffused over the whole region of the heart, and the normal sounds of the heart are greatly increased in intensity. Percussion reveals an enlarged area of dullness, while the impulse is usually much stronger than normal.

Dropsy of the pericardium will give the same wide space of dullness, but the impulse and sound are lessened. An animal with a moderate degree of enlargement may possibly live a number of years and be capable of ordinary work; it depends largely upon concomitant disease. As a rule, an animal affected with hypertrophy of the heart will soon be incapacitated for work, and become useless and incurable.

Treatment.—If the cause can be discovered and is removable it should be done. The iodide of potassa, in cases of valvular thickening, may be of some benefit if continued for a sufficient length of time; it may be given in 2-dram doses, twice a day, for a month or more. Hydrocyanic acid, in 30 drop doses twice a day, may relieve abnormal muscular irritability. General tonics, freedom from excitement or fatigue, avoidance of bulky food, good ventilation, etc., are indicated.

DILATATION OF THE HEART.

This is an enlargement of the cavities of the heart, and may be confined to one or extend to all. Two forms of dilatation may be mentioned—*simple dilatation*, where there is normal thickness of the walls, and *passive* or *attenuated dilatation*, where the walls are simply distended or stretched out without any addition of substance.

Causes.—Any cause producing constant and excessive exertion of the heart may lead to dilatation. Valvular disease is the most frequent cause. General anæmia predisposes to it by producing relaxation of muscular fiber. Changes in the muscular tissue of the heart-walls, serous infiltration from pericarditis, myocarditis, fatty degeneration

and infiltration, atrophy of the muscular fibers, may all lead to dilatation.

Symptoms.—The movements of the heart are feeble and prolonged, a disposition to staggering or vertigo, dropsy of the limbs, very pale or very dark-colored membranes, and difficult breathing on the slightest excitement.

Treatment.—General tonics, rich food, and rest.

FATTY DEGENERATION OF THE HEART.

Fatty degeneration may involve the whole organ, or may be limited to its walls, or even to circumscribed patches. The latter is situated at the exterior, and gives it a mottled appearance. When generally involved it is flabby or flaccid, and in extreme cases collapses when emptied or cut. Upon dissection the interior of the ventricles is observed to be covered with buff-colored spots of a singular zigzag form. This appearance may be noticed beneath the pericardium, and pervading the whole thickness of the ventricular walls, and in extreme cases those of the fleshy columns in the interior of the heart. These spots are found to be degenerated muscular fibers and colonies of oil-globules. Fatty degeneration is often associated with other morbid conditions of the heart, as obesity, dilatation, rupture, aneurism, etc. It may be connected with fatty diseases of other organs, as the liver, kidneys, etc. When it exists alone its presence is seldom suspected previous to death. It may be secondary to hypertrophy of the heart, to myocarditis, or to pericarditis. It may be due to deteriorated conditions of the blood in wasting diseases, excessive hemorrhages, etc., or to poisoning with arsenic and phosphorus.

Symptoms.—The most prominent symptoms of fatty degeneration are a feeble action of the heart, a remarkably slow pulse, general debility, and attacks of vertigo. It may exist for a long time, but is apt to suddenly terminate in death upon the occurrence of other diseases, surgical operations, etc. It may involve a liability to sudden death from rupture of the ventricular walls.

Treatment.—Confinement in feed to oats, wheat or rye bran, and timothy hay. Twenty drops of sulphuric acid may be given in drinking-water three times a day, and hypophosphite of iron in 2-dram doses, mixed with the feed twice a day. Other tonics and stimulants as they may be indicated.

ATROPHY OF THE HEART—WASTING.

A diminution of muscular substance of the heart and consequent decrease in bulk and weight. It is generally due to imperfect nutrition from occlusion of the blood-vessels which supply it.

Symptoms.—The heart beat is weak and hardly perceptible; the area of dullness over the region of the heart is lessened. Further than this

it furnishes no characteristic symptoms which distinguish it from some other diseases of this organ. Treatment is of no avail.

RUPTURE OF THE HEART.

This may occur as the result of some previous disease, as fatty degeneration, dilatation with weakness of the muscular walls, etc. It may be caused by external violence, a crushing fall, pressure of some great weight, etc. Usually, death follows a rupture very quickly, though an animal may live for some time when the rent is not very large.

WEAKNESS OF THE HEART.

This may arise from general debility, the result of exhausting disease, overwork or heart strain, or loss of blood. It is indicated by a small, feeble, but generally regular pulse, coldness of the body, etc.

Treatment.—This should be directed to support and increase the strength of the animal, by tonics, rest, and nutritious food. Carbonate of ammonia may be given to stimulate the heart's action and to prevent the formation of heart-clot.

CONGESTION OF THE HEART.

Congestion, or an accumulation of the blood in the cavities of the heart, may occur in consequence of fibrinous deposits interfering with the free movements of the valves, usually the product of endocarditis.

Symptoms.—Great difficulty of breathing, paleness of the visible mucous membranes, great anxiety, frequently accompanied by a general tremor and cold perspiration, followed by death. It usually results in death very quickly.

CYANOSIS.

This is a condition sometimes found in foals immediately after birth, and is due to non-closure of the *foramen ovale*, which allows a mixtuer of the venous with the arterial blood in the left cavities of the heart. It is characterized by a dark purple or bluish color of the visible mucous membranes, shortness of breath, and general feebleness. Foals thus affected generally live only a few hours after birth.

DISEASES OF ARTERIES—ARTERITIS AND ENDARTERITIS.

Inflammation of arteries is rarely observed in the horse as a primary affection. Direct injuries, such as blows, may produce a contusion and subsequent inflammation of the wall of an artery; severe muscular strain may involve an arterial trunk; hypertrophy of the heart, by increasing arterial tension, may result in the production of a general endarteritis. Septic infection may affect the inner coat and ultimately involve all three, or it may be the result of an inflammation in the vicinity of the vessels, etc. Inflammation of arteries, whatever

the cause may be, often leads to very serious results in the development of secondary changes in their walls. Arteritis may be acute, subacute, or chronic; when the inner coat alone is affected it is known as *endarteritis.*

Symptoms.—Arteritis is characterized by a painful swelling along the inflamed vessel, throbbing pulse, coldness of the parts supplied by the inflamed vessel, sometimes the formation of gangrenous sloughs, suppuration, abscess, etc. In an inflammation of the iliac arteries we find coldness and excessive lameness or paralysis of one or both hind limbs.

Pathology.—In acute arteritis we find swelling along the vessel, loss of elasticity, friability, and thickening of the walls; a roughness and loss of gloss of the inner coat, with the formation of coagula or pus in the vessel. Subacute or chronic arteritis may affect only the the outer coat—*periarteritis*; both the outer and middle coat, or the inner coat alone—*endarteritis*; and by weakening the respective coats leads to rupture, aneurism, or to degenerations, such as bony, calcareous, fatty, atheromatous, etc. It may also lead to sclerosis or increase of fibrous tissue, especially in the kidneys, when it may result in the condition known as *arterio-capillary fibrosis.* Chronic endarteritis is fruitful in the production of thrombus and atheroma. Arteritis may be limited to single trunks, or it may affect, more or less, all the arteries of the body. Arteries which are at the seat of chronic endarteritis are liable to suffer degenerative changes, consisting chiefly of fatty degeneration, calcification, or the breaking down of the degenerated tissue, and the formation of erosions or ulcer-like openings in the inner coat. These erosions are frequently called atheromatous ulcers, and fragments of tissue from these ulcers may be carried into the circulation, forming emboli. Fibrinous thrombi are apt to form upon the roughened surface of the inner coat, or upon the surface of the erosions.

Fatty degeneration and calcification of the middle and outer coats may occur, and large, hard, calcareous plates project inward, upon which thrombi may form or may exist in connection with atheroma of the inner coat. When there is much thickening and increase of new tissue in the wall of the affected artery, it may encroach upon the capacity of the vessel, and even lead to obliteration. This is often associated with interstitial inflammation of glandular organs.

Treatment.—Carbonate of potassa in dram doses, to be given in four ounces liquor acetate of ammonia every six hours. Scalded bran sufficient to produce loosening of the bowels, and complete rest. Externally, applications of hot water or hot hop infusion.

ATHEROMA.

Atheroma is a direct result of an existing chronic endarteritis, the lining membrane of the vessels being invariably involved to a greater or less degree. It is most frequently found in the arteries, although

the veins may develop an atheromatous condition when exposed to any source of prolonged irritation. Atheroma may affect arteries in any part of the body; in some instances almost every vessel is diseased, in others only a few, or even parts of one vessel. It is a very common result of endocarditis extending into the aorta, which we find perhaps the most frequent seat of atheroma. As a result of this condition the affected vessel becomes impaired in its contractile power, loses its natural strength, and in consequence of its inability to sustain its accustomed internal pressure, undergoes, in many cases, dilatation at the seat of disease, constituting *aneurism*. In an atheromatous vessel, calcareous deposits soon occur, which render it rigid, brittle, and subject to ulceration or rupture. In such vessels the contractility is destroyed, the middle coat atrophied and beyond repair. Atheroma in the vessels of the brain is a frequent cause of cerebral apoplexy. No symptoms are manifested by which we can recognize this condition during life.

CONSTRICTION OF AN ARTERY.

This is usually the result of arteritis, and may partly or wholly be impervious to the flow of blood. When this occurs in a large vessel it may be followed by gangrene of the parts; usually, however, collateral circulation will be established to nourish the parts previously supplied by the obliterated vessel. In a few instances constriction of the aorta has produced death.

ANEURISM.

Aneurism is usually described as *true* and *false*. True aneurism is a dilatation of the coats of an artery over a larger or smaller part of its course. Such dilatations are usually due to chronic endarteritis and atheroma. False aneurism is formed after a puncture of an artery by a dilatation of the adhesive lymph by which the puncture was united.

Symptoms.—If the aneurism is seated along the neck or a limb, it appears as a tumor in the course of an artery, and pulsating with it. The tumor is round, soft, and compressible, and yields a peculiar fluctuation upon pressure. By applying the ear over it a peculiar purring or hissing sound may sometimes be heard. Pulsation, synchronous with the action of the heart, is the diagnostic symptom. It is of a slow, expansive, and heavy character, as if the whole tumor were enlarging under the hand. Aneurisms seated internally may occupy the cavity of the cranium, chest, or abdomen. As regards the first, little is known during life, for all the symptoms which they produce may arise from other causes. Aneurism of the anterior aorta may be situated very closely to the heart or in the arch, and it is very seldom that we can distinguish it from disease of the heart. The tumor may encroach upon the wind-pipe and produce difficulty in breathing, or it may produce pressure upon the venæ cavæ or the thoracic duct, obstructing the flow of blood and lymph.

In fact, whatever parts the aneurism may reach or subject to its pressure, may have their functions suspended or disturbed. When the tumor in the chest is large we generally find much irregularity in the action of the heart; the superficial veins of the neck are distended, and there is usually dropsical swelling under the breast and of the limbs. There may be a very troublesome cough without any evidence of lung affection. Sometimes pulsation of the tumor may be felt at the lower part of the neck where it joins the chest. When the aneurism occurs in the posterior aorta no diagnostic symptoms are appreciable; when it occurs in the internal iliac arteries an examination per rectum will reveal it.

There is one form of aneurism which is not unfrequently overlooked, affecting the anterior mesenteric artery, primarily induced by a worm—the *Strongylus armatus*. This worm produces an arteritis, with atheroma, degeneration, and dilatation of the mesenteric arteries, associated with thrombus and aneurism. The aneurism gives rise to colic, which appears periodically in a very violent and often persistent type. Ordinary colic remedies have no effect, and after a time the animal succumbs to the disease. In all cases of animals which are habitually subject to colicky attacks, parasitic aneurism of the anterior mesenteric artery may be suspected.

Pathology.—Aneurisms may be diffuse or sacculated. The diffuse consists in a uniform dilatation of all the coats of an artery, so that it assumes the shape of a cylindrical swelling. The wall of the aneurism is atheromatous or calcified; the middle coat may be atrophied. The sacculated or circumscribed aneurism consists either in a dilatation of the entire circumference of an artery over a short portion of its length, or in a dilatation of only a small portion of one side of the wall. Aneurism may become very large; as it increases in size it presses upon and causes the destruction of neighboring tissues. The cavity of the aneurismal sac is filled with fluid or clotted blood, or with layers of fibrin which adhere closely to its wall. Death is produced usually by the pressure and interference of the aneurism with adjoining organs, or by rupture. In worm aneurism we usually find large thrombi within the aneurismal dilatation of the artery, which sometimes plug the whole vessel or extend into the aorta. Portions of this thrombus or clot may be washed away and produce embolism of a smaller artery. The effect in either case is to produce anæmia of the intestinal canal, serous or bloody exudation in its walls, which leads to paralysis of the intestine and resultant colicky symptoms.

Treatment.—The only treatment advisable is to extirpate or ligate the tumor above and below.

RUPTURE OF AN ARTERY.

Endarteritis, with its subsequent changes in the walls of arteries, is the primary cause of rupture in the majority of instances. The rupture

may be partial, involving only one or two coats, and will then form an aneurism. If complete, it may produce death when it involves a large vessel, especially if it is situated in one of the large cavities permitting an excessive escape of blood. Rupture may be produced by mechanical violence or accident.

Symptoms.—In fatal rupture associated with profuse bleeding, the animal becomes weak, the visible mucuous membranes become blanched, the breathing hurried or gasping, pupils dilated, staggering in gait, syncope, death. When the hemorrhage is limited, the symptoms may not become noticeable; if it is near the surface of the body a round or diffuse swelling or tumor may form, constituting a *hygroma.* If the rupture is associated with an external wound the bleeding artery should be ligated, or where a bandage is applicable, pressure may be applied by tight bandaging. As a secondary result of rupture of an artery we may have formation of abscess, gangrene of a part, etc.

Treatment.—When rupture of a deep-seated artery is suspected, large doses of fluid extract of ergot may be given to produce contraction of the blood-vessels. Tannin and iron are also useful. The animal should be allowed to have as much water as he desires. Afterwards stimulants and nourishing food are indicated.

THROMBUS AND EMBOLISM.

By thrombosis is generally understood the partial or complete closure of a vessel by a morbid product developed at the site of the obstruction. The coagulum, which is usually fibrinous, is known as a thrombus. The term embolism designates an obstruction caused by any body detached and transported from the interior of the heart, or of some vessel. Thrombi occur as the result of an injury to the wall of the vessel, or may follow its compression or dilatation; they may result from some alteration of the wall of the vessel by disease, or by the retardation of the circulation. These formations may occur during life, in the heart, arteries, veins, or in the portal system. When a portion of fibrin coagulates in one of the arteries and is carried along by the circulation, it will be arrested, of course, in the capillaries, if not before; when in the veins it may not be stopped until it reaches the lungs; and when in the portal system the capillaries of the liver will prevent its further progress. The formation of thrombi may act primarily by causing partial or complete obstruction, and secondarily, either by larger or smaller fragments becoming detached from their end, and by being carried along by the circulation of the blood to remote vessels, embolism; or by the coagulum becoming softened and converted into pus, constituting suppurative phlebitis. These substances occur most frequently in those affections characterized by great exhaustion or debility, as pneumonia, purpura hæmorrhagica, endocarditis, phlebitis, puerpural fever, hemorrhages, etc. These concretions may form suddenly and produce instantaneous death by retarding the blood current, or they may arise

gradually, in which case the thrombi may be organized and attached to the walls of the heart, or they may soften, and fragments of them (emboli) may be carried away. The small, wart-like excrescences, occurring sometimes in endocarditis, may occasionally form a foundation on which a thrombi may develop.

Symptoms.—When heart clot or thrombus exists in the right side the return of blood from the body and the aeration in the lungs is impeded, and if death occurs it is owing to syncope rather than to strangulation in pulmonary respiration. There will be hurried and gasping breathing, paleness and coldness of the surface of the body, a feeble and intermittent or fluttering pulse, and fainting. When a fibrinous coagulum is carried into the pulmonary artery from the right side of the heart, the indications are a swelling and infiltration of the lungs and pulmonary apoplexy. When the clot is situated in the left cavities of the heart or in the aorta, death, if it occurs, takes place either suddenly or at the end of a few hours from coma.

Pathology.—When a coagulum is observed in the heart it may become a question whether it was formed during life or after death. The loose, dark coagula, so often found after death, are polypi. If the deposition has taken place during the last moments of life, the fibrin will be isolated and soft, but not adherent to the walls; if it be isolated, dense, and adherent or closely intertwined with the muscles of the papillæ and tendinous cords, the deposition has occurred more or less remote from the act of dying. Occasionally the fibrin may be seen lining one of the cavities of the heart, like a false endocardium, or else forming an additional coat to the aorta or other large vessels without producing much obstruction. Thrombi, in some instances, soften in their centers, and are then observed to contain a pus-like substance. If this softening has extended considerably an outer shell or cyst only may remain. The sources of danger exist not only in the interruption of the circulation of the blood, but also in a morbid state of the system, produced by the disturbed nutrition of a limb or organ, as well as the mingling of purulent and gangrenous elements with the blood.

Treatment.—The urgent symptoms should be relieved by rest, stimulants, and the use of agents which will act as solvents to the fibrinous clots. Alkalies are specially useful for this purpose. Carbonate of ammonia may be administered in all cases of thrombus, and should be continued for a long time in small doses several times a day. In cases of great debility associated with a low grade of fever, stimulants and tonics, and nitro-muriatic acid as an antiseptic, may be beneficial.

DISEASES OF VEINS—PHLEBITIS.

Inflammation of veins may be simple or diffuse. In simple phlebitis the disease of the vein is confined to a circumscribed or limited portion of a vein; in diffuse it involves the vein for a long distance; it may even extend from a limb or foot to the heart.

Causes.—Phlebitis may be induced by contusions or direct injuries, an extension of inflammation from surrounding tissue, as in abscess, formation of tumor, or malignant growth. It is often due to embolism of infective material, gangrenous matter, etc. Blood-letting from the jugular vein is occasionally followed by dangerous phlebitis.

Symptoms.—The symptoms vary according to the extent and severity of the inflammation. In most cases the vein is swollen, thickened, and indurated to such a degree as to resemble an artery. A diffused swelling, with great tenderness, may extend along the affected vessel and the animal manifest all the symptoms connected with acute fever and general functional disturbance.

Pathology.—The disease is only serious when large veins are affected. The coats undergo the same changes as in arteritis, clots of blood and lymph plug the inflamed vessel, and if the inflammatory process continues these are converted into pus, which ruptures the vessel and produces a deep abscess; or it may be carried away in the circulation and produce metastatic abcess in the lungs or other remote organs. In mild cases the clots may become absorbed and the vessel restored to health. Phlebitis in the course of the veins of the limbs frequently leads to numerous abscesses, which may be mistaken for farcy ulcerations. A very common result of phlebitis is an obliteration of the affected portion of the vein, but as collateral circulation is readily established this is seldom of any material inconvenience.

Treatment.—Phlebitis should be treated by the application of a smart blister along the course of the inflamed vessel; early opening of any abscesses which may form; the animal should have complete rest, and the bowels be kept loose with bran mashes. When the fever runs high, half-ounce doses of nitrate of potassa may be given in the drinking water, which may be changed in two or three days for dram doses of the iodide of potassa. If the animal becomes debilitated, carbonate of ammonia, 1 dram, and powdered gentian, 3 drams, may be given every six hours.

VARICOSE VEINS—VARIX—DILATATION OF VEINS.

This may be a result of weakening of the coats from inflammatory disease and degeneration. It may also be due to mechanical obstruction from internal or external sources. It is sometimes found in the vein which lies superficial over the inside of the hock-joint, and may be due to the pressure of a spavin. Occasionally it may be observed in stallions, which are more or less subject to *varicocele* or dilatation of the veins of the testicular cord. Hemorrhoidal veins or piles are occasionally met with, generally in horses which run at pasture. Varicose veins may ulcerate and form an abscess in the surrounding tissues, or they may rupture from internal blood pressure and the blood form large tumors where the tissues are soft.

Treatment.—Stallions which manifest a tendency to varicocele should

wear suspensory bags when they are exercised. Piles may often be reduced by astringent washes—tea made from white oak bark or a saturated solution of alum. The bowels should be kept loose with bran mashes and the animal kept quiet in the stable. When varicose veins exist superficially and threaten to produce inconvenience, they may be ligated above and below and thus obliterated. Sometimes absorption may be induced by constant bandages.

AIR IN VEINS—AIR EMBOLISM.

It was formerly supposed that the entrance of air into a vein at the time of the infliction of a wound or in blood-letting was extremely dangerous and very often produced sudden death by interfering with the circulation of the blood through the heart and lungs. Danger from air embolism is exceedingly doubtful, unless great quantities were forced into a large vein by artificial means.

PURPURA HEMORRHAGICA.

Purpura hemorrhagica usually occurs as a sequel to debilitating diseases, such as strangles, influenza, etc. It may, however, arise in the absence of any previous disease in badly ventilated stables, among poorly-fed horses, and in animals subject to exhausting work and extreme temperatures. It is apparently due to a primary deterioration of the blood, weakness of the capillary vessels, and general debility or exhaustion of the nervous system. Its gravity does not depend so much upon the amount of blood extravasated as it does upon the disturbance or diminished action of the vasomotor centers.

Symptoms.—This disease becomes manifested by the occurrence of sudden swellings on various parts of the body, on the head or lips, limbs, abdomen, etc. They may be diffused or very markedly circumscribed, though in the advanced stages they cover large areas. They pit on pressure and are but slightly painful to the touch. The limbs may swell to a very large size, the nostrils may become almost closed, and the head and throat may swell to the point of suffocation. The swellings not infrequently disappear from one portion of the body and develop on another, or may recede from the surface and invade the intestinal mucous membrane. The mucous lining of the nostrils and mouth is covered with dark red or purple spots, a bloody colored serum flows from the nostrils, the tongue may be swollen and prevent eating or closing of the jaws. In twenty-four or forty-eight hours bloody serum may exude through the skin over the swollen parts, and finally large gangrenous sloughs may form. The temperature is never very high, the pulse is frequent and compressible, and becomes feebler as the animal loses strength. A cough is usually present. The urine is scanty and high colored, and when the intestines are much affected a bloody diarrhea may set in, with colicky pains. Some of the internal organs

become implicated in the disease, the lungs may become œdematous, extravasation may occur in the intestinal canal, or effusion of serum into the cavity of the chest or abdomen; occasionally the brain becomes affected. A few cases run a mild course and recovery may commence in three or four days, generally, however, the outlook is unfavorable. In severe cases septic poisoning is liable to occur, which soon brings the case to a fatal issue.

Pathology.—On section we find the capillaries dilated, the connective tissue filled with a coagulable or coagulated lymph, and frequently we may discover gangrenous spots beneath the skin or involving the skin. The lymphatic glands are swollen and inflamed. Extensive extravasations of blood may be found imbedded between the coats of the intestines, or excessive effusion into the substance of the lungs.

Treatment.—Diffusible stimulants and tonics should be given from the very start, regardless of fever or frequency of the pulse. Carbonate of ammonia, 1 dram; fluid extract of red cinchona bark, 2 drams, and tincture of ginger half an ounce, with half a pint of water; thin gruel or milk should be given every four or six hours. Sulphate of iron in dram doses may be dissolved in water and given every six hours. Chlorate of potassa in 2-ounce doses may be given every eight or twelve hours. When the discharges from the mouth and nose become offensive to the smell, 10 drops of carbolic acid in 2 ounces of water may be given in a drench, or thrown on the root of the tongue with a syringe several times a day. Where the swelling is very great, incisions half an inch in length penetrating the skin should be made with a sharp knife, to permit drainage. The application of liniments or washes externally are of no use, and if injudiciously used may do harm. Complications, when they arise, must be treated with proper circumspection.

DISEASES OF THE LYMPHATIC SYSTEM.

The lymphatic or absorbent system is connected with the blood vascular system, and consists of a series of tubes which absorb and convey to the blood certain fluids. These tubes lead to lymphatic glands, through which the fluids pass to reach the right lymphatic vein and thoracic duct, both of which enter the venous system near the heart. Through the excessively thin walls of the capillaries the fluid part of the blood transudes, to nourish the tissues outside the capillaries; at the same time fluid passes from the tissues into the blood. The fluid, after it passes into the tissues, constitutes the lymph, and acts like a stream irrigating the tissue elements. Much of the surplus of this lymph passes into the lymph vessels, which in their commencement can hardly be treated as independent structures, since their walls are so closely joined with the tissues through which they pass, being nothing more than spaces in the connective tissue until they reach the larger lymph vessels, which finally empty into lymph glands. These lymph glands are structures so placed that the lymph flowing towards the

larger trunks passes through them, undergoing a sort of filtration. From the fact of this arrangement lymph glands are subject to inflammatory diseases in the vicinity of diseased structures, because infective material being conveyed in the lymph stream lodges in the glands and produces irritation.

LOCAL INFLAMMATION AND ABSCESS OF LYMPHATIC GLANDS.

Acute inflammation of the lymph glands usually occurs in connection with some inflammatory process in the region from which its lymph is gathered. Several or all of the glands in a cluster may become affected, as in strangles, nasal catarrh, or nasal gleet, diseased or ulcerated teeth, the lymph glands between the branches of the lower jaw almost invariably become affected, which may lead to suppuration or induration. Similar results obtain in other portions of the body; in pneumonia the bronchial glands become affected; in pharyngitis, the post-pharyngeal glands lying above the trachea become affected, etc.

Symptoms.—The glands swell and become painful to the touch, the connective tissue surrounding them becomes involved, suppuration usually takes place, and one or more abscesses form. If the inflammation is of a milder type, resolution may take place and the swelling recede, the exudative material being absorbed, and the gland restored without the occurrence of suppuration. In the limbs a whole chain of the glands along the lymphatic vessels may become affected, as in farcy, phlebitis, or septic poisoning.

Treatment.—Fomentation with hot water, the application of camphorated soap liniment, or camphorated oil, may produce a revulsive action and prevent suppuration. If there is any indication of abscess forming, poultices of linseed meal and bran made into a paste with hot water should be applied, or a mild blistering ointment rubbed in over the swollen gland. As soon as fluctuation can be felt a free opening must be made for the escape of the contained pus. The wound may subsequently be washed out with a solution of chloride of zinc, 5 grains to the ounce of water, three times a day.

HYPERTROPHIED LYMPHATICS.

This is characterized by an enlargement and growth of lymphatic glands; the causes are obscure, but they sometimes attain an enormous size, and seriously interfere with neighboring organs. This condition is sometimes found in the region of the throat above the larynx, and produces wheezing or roaring, by pressing upon the recurrent laryngeal nerve. It may occur in the bronchial glands of the chest, and interfere with the action of the heart and respiration. The swelling is not painful or feverish, it may be very hard or may be rather soft; occasionally they contain a cheesy deposit or even undergo calcification. A condition almost similar to this may be induced by chronic inflammation. In such cases, however, the glandular structure may become lessened, as the

result of pressure by an increase of fibrous or connective tissue, although a large tumor at the site of the gland remains. This may become gradually absorbed, more often, however, recurrence of inflammation takes place and frequently small abscesses form.

Treatment.—Repeated blistering with ointment of cantharides 8 parts, bin-iodide of mercury 1 part, to be thoroughly mixed and applied once in ten days or two weeks. If this fails, extirpation will become necessary.

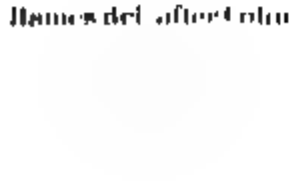
LYMPHANGITIS.

Specific inflammation of the lymphatic structures, usually affecting the hind leg, very seldom a fore leg. This disease is very sudden in its attack, exceedingly painful, accompanied by a high temperature, and great general disturbance.

Causes.—Horses of lymphatic or sluggish temperament are predisposed to this affection. It usually attacks well-fed animals, and in such cases may be due to an excess of nutritive elements in the blood. Sudden changes in work or in the habits of the animal may induce an attack.

Symptoms.—It is usually ushered in by a chill, rise in temperature, and some uneasiness; in a very short time this is followed by lameness in one leg and swelling on the inside of the thigh. The swelling gradually surrounds the whole limb, continues on downward until it reaches the foot. The limb is excessively tender to the touch, the animal perspires, the breathing is accelerated, pulse hard and quick, and the temperature may reach 106° Fah. The bowels early become constipated, and the urine scanty. The symptoms usually are on the increase for about two days, then they remain stationary for the same length of time; the fever then abates; the swelling recedes and becomes less painful. It is very seldom, though, that all the swelling leaves the leg; generally it leaves some permanent enlargement, and the animal becomes subject to recurrent attacks. Occasionally, the inguinal lymphatic glands (in the groin) undergo suppuration, and pyæmia may supervene and prove fatal. In severe cases the limb becomes denuded of hair in patches, the skin remains indurated with a fibrous growth, which is known by the name of *elephantiasis*.

Treatment.—Fomentations with vinegar and water, equal parts, to which add 2 ounces of nitrate of potassa for each gallon. This should be applied every ten or fifteen minutes for six or eight hours, then the leg may be dried with a woolen cloth and bathed with camphorated soap liniment. Internally, administer tincture of digitalis and aconite root, equal parts of each, 30 drops every hour until the fever and pulse become reduced. Half-ounce doses of nitrate of potassa in the drinking-water every six hours, bran mashes, and complete rest. This treatment, if instituted early in the attack, very frequently brings about a remarkable change within twenty-four hours.



INTERIOR OF CHEST SHOWING POSITION OF HEART AND DIAPHRAGM.

Heart
Right half
Left half bl
Auricles, ut
Ventricles, ut
Arteries, red
Veins, blue
1 *Left carotid*
2 *Left jugular*
3 *Portal system*
4 *Vessels of the*
5 *Arteries of the*
6 *Vessels of the*
7 *Vessels of the*
8 *Artery of left*

DISEASES OF THE EYE.

By Dr. JAMES LAW, F. R. C. V. S.,
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We can scarcely overestimate the value of sound eyes in the horse, and hence all diseases and injuries which seriously interfere with vision are matters of extreme gravity and apprehension, for should they prove permanent they invariably depreciate the selling price to a considerable extent. A blind horse is always dangerous in the saddle or in single harness, and he is scarcely less so when, with partially impaired vision, he sees things imperfectly, in a distorted form or in a wrong place, and when he shies or avoids objects which are commonplace or familiar. When we add to this that certain diseases of the eyes, like recurring inflammation (moon blindness), are habitually transmitted from parent to offspring, we can realize still more fully the importance of these maladies. Again, as a mere matter of beauty, a sound, full, clear, intelligent eye is something which must always add a high value to our equine friends and servants.

THE EYEBALL.

A full description of the structure of the eye is incompatible with our prescribed limits, and yet a short description is absolutely essential to the clear understanding of what is to follow.

The horse's eye is a spheroidal body, flattened behind, and with its posterior four-fifths inclosed by an opaque, white, strong fibrous membrane (the sclerotic), on the inner side of which is laid a more delicate friable membrane, consisting mainly of blood-vessels and pigment cells (the choroid), and that in its turn is lined by the extremely delicate and sensitive expansion of the nerve of sight (the retina). The anterior fifth of the globe of the eye bulges forward from what would have been the direct line of the sclerotic, and thus forms a segment of a much smaller sphere than is inclosed by the sclerotic. Its walls, too, have in health a perfect translucency from which it has derived the name of *transparent cornea*. This transparent coat is composed, in the main, of fibres with lymph interspaces, and it is to the condition of these and their condensation and compression that the translucency is largely due. This may be shown by compressing with the fingers the eye of an ox which has just

been killed, when the clear transparent cornea will suddenly become clouded over with a whitish blue opacity, and this will remain until the compression is interrupted. The interior of the eye contains three transparent media for the refraction of the rays of light, on their way from the cornea to the visual nerve. Of these media the anterior one (aqueous humor) is liquid, the posterior (vitreous humor) is semi-solid, and the intermediate one (crystalline lens) is solid. The space occupied by the aqueous humor corresponds nearly to the portion of the eye covered by the transparent cornea. It is, however, divided into two chambers, anterior and posterior, by the iris, a contractile curtain with a hole in the center (the pupil), and which may be looked on as in some sense a projection inward of the vascular and pigmentary coat from its anterior margin at the point where the sclerotic or opaque outer coat becomes continuous with the cornea or transparent one. This iris, or curtain, besides its abundance of blood-vessels and pigment, possesses two sets of muscular fibers, one set radiating from the margin of the pupil to the outer border of the curtain at its attachment to the sclerotic and choroid, and the other encircling the pupil in the manner of a ring. The action of the two sets is necessarily antagonistic, the radiating fibers dilating the pupil and exposing the interior of the eye to view, while the circular fibers contract this opening and shut out the rays of light. The form of the pupil in the horse is ovoid, with its longest diameter from side to side and its upper border is fringed by several minute black bodies (corpora nigra) projecting forward and serving to some extent the purpose of eyebrows in arresting and absorbing the excess of rays of light which fall upon the eye from above. These pigmentary projections in front of the upper border of the pupil are often mistaken for the products of disease or injury, in place of the normal and beneficient protectors of the nerve of sight which they are. They may, like all other parts, become the seat of disease, but so long as they and the iris retain their clear, dark aspect, without any tints of brown or yellow, they may be held to be healthy.

The vitreous or semi-solid refracting medium occupies the posterior part of the eye—the part corresponding to the sclerotic, choroid, and retina—and has a consistency corresponding to that of the white of an egg, and a power of refraction of the light-rays correspondingly greater than the aqueous humor.

The third or solid refracting medium is a biconvex lens, with its convexity greatest on its posterior surface, which is lodged in a depression in the vitreous humor, while its anterior surface corresponds to the opening of the pupil. It is inclosed in a membranous covering (capsule), and is maintained in position by a membrane (suspensory ligament) which extends from the margin of the lens outward to the sclerotic at the point of junction of the choroid and iris. This ligament is, in its turn, furnished with radiating muscular fibers, which change the form or position of the lens so as to adapt it to see with equal clearness objects at a distance or close by.

Another point which strikes the observer of the horse's eye is that in the darkness a bright bluish tinge is reflected from the widely-dilated pupil. This is owing to a comparative absence of pigment in the choroid coat inside the upper part of the eyeball, and enables the animal to see and advance with security in darkness where the human eye would be of little use. The lower part of the cavity of the horse's eye, into which the dazzling rays fall from the sky, is furnished with an intensely black lining, by which the rays penetrating the inner nervous layer are instantly absorbed.

MUSCLES OF THE EYE.

These consist of four straight muscles, two oblique and one retractor. The straight muscles pass from the depth of the orbit forward on the inner, outer, upper, and lower sides of the eyeball, and are fixed to the anterior portion of the fibrous (sclerotic) coat, so that in contracting singly they respectively turn the eye inward, outward, upward, and downward. When all act together they draw the eyeball deeply into its socket. The retractor muscle also consists of four muscular slips, repeating the straight muscles on a smaller scale, but as they are only attached on the back part of the eyeball they are less adapted to roll the eye than to draw it down into its socket. The two oblique muscles rotate the eye on its own axis, the upper one turning its outer surface upward and inward, and the lower one turning it downward and inward.

THE HAW—THE WINKING CARTILAGE—CARTILAGO NICTATANS.

This is a structure, which, like the retractor muscle, is not found in the eye of man, but it serves in the lower animals to assist in removing foreign bodies from the front of the eyeball. It consists, in the horse, of a cartilage of irregular form, thickened inferiorly and posteriorly where it is intimately connected with the muscles of the eyeball, and the fatty material around them; and expanded and flattened anteriorly where its upper surface is concave, and, as it were, moulded on the lower and inner surface of the eyeball. Externally, it is covered by the mucous membrane which lines the eyelids and extends over the front of the eye. In the ordinary restful state of the eye the edge of this cartilage should just appear as a thin fold of membrane at the inner angle of the eye, but when the eyeball is drawn deeply into the orbit the cartilage is pushed forward, outward, and upward over it until the entire globe may be hidden from sight. This protrusion of the cartilage, so as to cover the eye, may be induced in the healthy eye by pressing the finger and thumb on the upper and lower lids, so as to cause retraction of the eyeball into its socket. When foreign bodies, such as sand, dust, and chaff, or other irritants, have fallen on the eyeball or eyelids, it is similarly projected to push them off, their expulsion being further favored by a profuse flow of tears.

This is seen, to a lesser extent, in all painful inflammations of the eye, and to a very marked degree in lockjaw, when the spasm of the muscles of the eyeball draws the latter deeply into the orbit and projects forward the masses of fat and the cartilage. The brutal practice of cutting off this apparatus, whenever it is projected, necessitates this explanation which, it is hoped, may save to many a faithful servant a most valuable appendage. That the cartilage and membrane may become the seat of disease is undeniable, but so long as its edge is thin and even, and its surface smooth and regular, the mere fact of its projection over a portion or the whole of the eyeball is no evidence of disease in its substance, nor any warrant for its removal. It is usually but the evidence of the presence of some pain in another part of the eye, which the suffering animal endeavors to assuage by the use of this beneficient provision. For the diseases of the cartilage itself see "Encephaloid Cancer."

LACHRYMAL APPARATUS.

This consists, first, of a gland for the secretion of the tears, and, second, of a series of canals for the conveyance of the superfluous tears into the cavity of the nose.

The gland is situated above the outer part of the eyeball, and the tears which have flowed over the eye and reached the inner angle are there directed by a small conical papilla (lachrymal caruncle) into two minute orifices, and thence by two ducts (lachrymal) to a small pouch (lachrymal sac) from which a canal leads through the bones of the face into the nose. This opens in the lower part of the nose on the floor of the passage, and a little outside the line of union of the skin which lines the false nostril with the mucous membrane of the nose. In the ass and mule this opening is situated on the roof instead of the floor of the nose, but still close to the external opening.

EXAMINATION OF THE EYE.

To avoid unnecessary repetition the following general directions are given for the examination of the eye: The eye, and to a certain extent the mucous membrane lining the eyelids, may be exposed to view by gently parting the eyelids with the thumb and forefinger pressed on the middle of the respective lids. The pressure, it is true, causes the protrusion of the haw over a portion of the lower and inner part of the eye, but by gentleness and careful graduation of the pressure this may be kept within bounds, and oftentimes even the interior of the eye can be seen. As a rule it is best to use the right hand for the left eye, and the left hand for the right, the finger in each case being pressed on the upper lid while the thumb depresses the lower one. In cases in which it is desirable to examine the inner side of the eyelid farther than is possible by the above means, the upper lid may be drawn down by the eyelashes with the one hand and then everted over the tip of the fore-

finger of the other hand, or over a probe laid flat against the middle of the lid. Where the interior of the eye must be examined it is useless to make the attempt in the open sunshine or under a clear sky. The worst cases, it is true, can be seen under such circumstances, but for the slighter forms the horse should be taken indoors, where all light from above will be shut off, and should be placed so that the light shall fall on the eye from the front and side. Then the observer, placing himself in front of the animal, will receive the reflected rays from the cornea, the front of the lens and the back, and can much more easily detect any cloudiness, opacity, or lack of transparency. The examination can be made much more satisfactory by placing the horse in a dark chamber and illuminating the eye by a lamp placed forward and outward from the eye which is to be examined. Any cloudiness is thus easily detected, and any doubt may be resolved by moving the lamp so that the image of the flame may be passed in succession over the whole surface of the transparent cornea and of the crystalline lens. Three images of the flame will be seen, the larger one upright, reflected from the anterior surface of the eye; a smaller one upright, reflected from the anterior surface of the lens; and a second small one inverted from the back surface of the lens. So long as these images are reflected from healthy surfaces they will be clear and perfect in outline, but, as soon as one strikes on an area of opacity, it will become diffused, cloudy, and indefinite. Thus, if the large upright image becomes hazy and imperfect over a particular spot of the cornea, that will be found to be the seat of disease and opacity. Should the large image remain clear, but the small upright one become diffuse and indefinite over a given point, it indicates opacity on the front of the capsule of the lens. If both upright images remain clear, while the inverted one becomes indistinct at a given point, then the opacity is in the substance of the lens itself or in the posterior part of its capsule.

If in a given case the pupil remains so closely contracted that the deeper parts of the eye can not be seen the eyelids may be rubbed with extract of belladonna, and in a short time the pupil will be found widely dilated.

DISEASES OF THE EYELIDS.

Congenital disorders.—Some faulty conditions of the eyelids are congenital, *as division of an eyelid in two*, after the manner of harelip, *abnormally small opening between the lids*, often connected with imperfect development of the eye, and *closure of the lids by adhesion.* The first is to be remedied by paring the edges of the division and then bringing them together, as in torn lids. The last two, if remediable at all, require separation by the knife, and subsequent treatment with a cooling astringent eye wash.

Nervous disorders.—*Spasm of the eyelids* may be owing to constitutional susceptibility, or to the presence of local irritants (insects, chemical

irritants, sand, etc.) in the eye, to wounds or inflammation of the mucous membrane, or to disease of the brain. When due to local irritation, it may be temporarily overcome by instilling a few drops of a 4 per cent. solution of cocaine into the eye, when the true cause may be ascertained and removed. The nervous or constitutional disease must be treated according to its nature.

Drooping eyelids—Ptosis.—This is usually present in the upper lid, or is at least little noticed in the lower. It is sometimes but a symptom of paralysis of one-half of the face, in which case the ear, lips, and nostrils on the same side will be found soft, drooping, and inactive, and even the half of the tongue may partake of the palsy. If the same condition exists on both sides there is difficult snuffling breathing, from the air drawing in the flaps of the nostrils in inspiration, and all food is taken in by the teeth, as the lips are useless. In both there is a free discharge of saliva from the mouth during mastication. This paralysis is a frequent result of injury, by a poke, to the seventh nerve, as it passes over the back of the lower jaw. In some cases the paralysis is confined to the lid, the injury having been sustained by the muscles which raise it, or by the supra-orbital nerve which emerges from the bone just above the eye. Such injury to the nerve may have resulted from fracture of the orbital process of the frontal bone above the eye ball.

The condition may, however, be due to spasm of the sphincter muscle, which closes the lids, or to inflammation of the upper lid, usually a result of blows on the orbit. In the latter case it may run a slow course with chronic thickening of the lid.

The paralysis due to the poke may be often remedied by, first, the removal of any remaining inflammation by a wet sponge worn beneath the ear and kept in place by a bandage; second, when all inflammation has passed by a blister on the same region, or by rubbing it daily with a mixture in equal proportions of olive oil and strong aqua ammonia. Improvement is usually slow, and it may be months before complete recovery ensues.

In paralysis from blows above the eyes the same treatment may be applied to that part.

Thickening of the lid may be treated by painting with tincture of iodine, and that failing, by cutting out an ellipitical strip of the skin from the middle of the upper lid and stitching the edges together.

INFLAMMATION OF THE EYELIDS.

The eyelids suffer more or less in all severe inflammations of the eye, whether external or internal, but inasmuch as the disease sometimes starts in the lids and at other times is exclusively confined to them, it deserves independent mention.

Among the causes may be named: exposure to draughts of cold air, or to cold rain or snow-storms; the bites or stings of mosquitoes, flies,

and other insects; snake-bites, pricks with thorns, blows of whip or club; accidental bruises against the stall or ground, especially during the violent struggles of colic, enteritis, phrenitis (staggers), and when thrown for operations. It is also a result of infecting inoculations, as of erysipelas, anthrax, boil, etc., and is noted by Leblanc as especially prevalent among horses kept on low marshy pastures. Finally, the introduction of sand, dust, chaff, beards of barley and seeds of the finest grasses, and the contact with irritant chemical powders, liquids, and gases (ammonia from manure or factory, chlorine, strong sulphur fumes, smoke, and other products of combustion, etc.), may start the inflammation. The eyelids often undergo extreme inflammatory and dropsical swelling in urticaria (nettlerash, surfeit), and in the general inflammatory dropsy known as purpura hæmorrhagica.

The affection will, therefore, readily divide itself into (1), inflammations due to constitutional causes; (2), those due to direct injury, mechanical or chemical; and (3), such as are due to inoculation with infecting material.

(1) Inflammations due to constitutional causes are distinguished by the absence of any local wound, and the history of a low damp pasture, exposure, indigestion from unwholesome food, or the presence elsewhere on the limbs or body of the general doughy swellings of purpura hæmorrhagica. The lids are swollen and thickened, it may be slightly or it may be so extremely that the eye ball can not be seen. If the lid can be everted to show its mucous membrane, that is seen to be of a deep red color, especially along the branching lines of the blood vessels. The part is hot and painful, and a profuse flow of tears and mucus escapes on the side of the face, causing irritation and loss of the hair. If improvement follows, this discharge becomes more tenacious, and tends to cause adhesion of the edges of the upper and lower lids and to mat together the eyelashes in bundles. This gradually decreases to the natural amount, and the redness and congested appearance of the eyes disappears, but swelling, thickening, and stiffness of the lids may continue for a length of time. There may be more or less fever according to the violence of the inflammation, but so long as there is no serious disease of the interior of the eye or of other vital organ this is usually moderate.

The *local treatment* consists in astringent, soothing lotions (sugar of lead 30 grains, laudanum 2 teaspoonsful, rain water—boiled and cooled—1 pint), applied with a soft cloth kept wet with the lotion, and hung over the eye by tying it to the headstall of the bridle on the two sides. If the mucous membrane lining the lids is the seat of little red granular elevations, a drop of a solution of 2 grains of nitrate of silver in an ounce of distilled water should be applied with the soft end of a clean feather to the inside of the lid twice a day. The patient should be removed from all such conditions (pasture, faulty food, exposure, etc.) as may have caused or aggravated the disease, and from dust and irritant

fumes and gases. He should be fed from a manger high enough to favor the return of blood from the head, and should be kept from work, especially in a tight collar, which would prevent the descent of blood by the jugular veins. His diet should be laxative and non-stimulating (grass, bran mashes, carrots, turnips, beets, potatoes, or steamed hay), and any costiveness should be corrected by a mild dose of linseed oil (1 to 1½ pints). In cold weather warm blanketing may be needful, and even loose flannel bandages to the limbs, and heat should never be sought at the expense of pure air.

(2) In inflammations due to local irritants of a non-infective kind, a careful examination will usually reveal their presence, and the first step must be their removal with a pair of blunt forceps or the point of a lead pencil. Subsequent treatment will be in the main the local treatment advised above.

(3) In case of infective inflammation, there will often be found a prick or tear by which the septic matter has entered, and in such case the inflammation will for a time be concentrated at that point. A round or conical swelling round an insect bite is especially characteristic. A snake bite is marked by the double prick made by the two teeth and by the violent and rapidly spreading inflammation. Erysipelas is attended with much swelling, extending beyond the lids, and causing the mucous membrane to protrude beyond the edge of the eyelid (chemosis). This is characterized by a bright, uniform, rosy red, disappearing on pressure, or later by a dark, livid hue, but with less branching redness than in noninfecting inflammation, and less of the dark, dusky, brownish or yellowish tint of anthrax. Little vesicles may appear on the skin, and pus may be found without any distinct limiting membrane, as in abscess. It is early attended by high fever and marked general weakness and inappetence. Anthrax of the lids is marked by a firm swelling, surmounted by a blister, with bloody serous contents, which tends to burst and dry up into a slough, while the surrounding parts become involved in the same way. Or it may show as a diffuse dropsical swelling, with less of the hard central sloughing nodule, but like that tending to spread quickly. In both cases alike the mucous membrane and the skin, if white, assume a dusky brown or yellowish brown hue, which is largely characteristic. This may pass into a black color by reason of the extravasation of blood. There appears early great constitutional disturbance, with much prostration and weakness and generalized anthrax symptoms.

The *treatment* of these will vary according to the severity. Insect bites may be touched with a solution of equal parts of glycerine and aqua ammonia, or a 10 per cent. solution of carbolic acid in water. Snake bites may be bathed with aqua ammonia, and the same agent given in doses of 2 teaspoonfuls in a quart of water. Or alcohol may be given in pint or quart doses, according to the size of the animal. In erysipelas the skin may be painted with tincture of muriate of iron, or

with a solution of 20 grains of iodine in an ounce of carbolic acid, and one-half an ounce of tincture of muriate of iron may be given thrice daily in a bottle of water. In anthrax the swelling should be painted with tincture of iodine, or of the mixture of iodine and carbolic acid, and if very threatening it may have the tincture of iodine injected into the swelling with a hypodermic syringe, or the hard mass may be freely incised to its depth with a sharp lancet and the lotion applied to the exposed tissues. Internally iodide of potassium may be given in doses of 2 drams thrice a day, or tincture of the muriate of iron every four hours.

STYE—FURUNCLE (BOIL) OF THE EYELID.

This is an inflammation of limited extent, advancing to the formation of matter and the sloughing out of a small mass of the natural tissue of the eyelid. It forms a firm, rounded swelling, usually near the margin of the lid, which suppurates and bursts in four or five days. Its course may be hastened by a poultice of chamomile flowers, to which have been added a few drops of carbolic acid, the whole applied in a very thin muslin bag. If the swelling is slow to open after having become yellowish-white, it may be opened by a lancet, the incision being made at right angles to the margin of the lid.

ENTROPION AND ECTROPION—INVERSION AND EVERSION OF THE EYE LID.

These are respectively caused by wounds, sloughs, ulcers, or other causes of loss of substance of the mucous membrane on the inside of the lid and of the skin on the outside; also of tumors, skin diseases, or paralysis which leads to displacement of the margin of the eyelid. As a rule they require a surgical operation, with removal of an eliptical portion of the mucous membrane or skin, as the case may be, but which requires the skilled and delicate hand of the surgeon.

TRICHIASIS.

This consists in the turning in of the eyelashes so as to irritate the front of the eye. If a single eyelash, it may be snipped off with scissors close to the margin of the eyelid, or pulled out by the root with a pair of flat-bladed forceps. If the divergent lashes are more numerous the treatment may be as for entropion by excising an elliptical portion of skin opposite the offending lashes, and stitching the edges together, so as to draw outward the margin of the lid at that point.

WARTS AND OTHER TUMORS OF THE EYELIDS.

The eyelids form a favorite site for tumors, and above all, warts, which consist in a simple diseased overgrowth (hypertrophy) of the surface layers of the skin. If small, these may be snipped off with scissors.

or tied around the neck with a stout waxed thread and left to drop off, the destruction being completed, if necessary, by the daily application of a piece of sulphate of copper (blue vitriol), until any unhealthy material has been removed. If more widely spread the wart may still be clipped off with curved scissors or knife, and the caustic thoroughly applied day by day.

A bleeding wart or erectile tumor is more liable to bleed, and is best removed by constricting its neck with the waxed cord or rubber band, or if too broad for this it may be transfixed through its base by a needle armed with a double thread, which is then to be cut in two and tied around the two portions of the neck of the tumor. If still broader the armed needle may be carried through the base of the tumor at regular intervals, so that the whole may be tied in moderately sized sections.

In gray and white horses black pigmentary tumors (melanotic) are common on the black portions of skin, such as the eyelids, and are to be removed by scissors or knife, according to their size. In the horse these do not usually tend to recur when thoroughly removed, but at times they prove cancerous (as is the rule in man), and then they tend to reappear in the same site or in internal organs with, it may be, fatal effect.

Encysted, honey-like (melicerous), sebaceous, and fibrous tumors of the lids all require removal with the knife.

TORN EYELIDS—WOUNDS OF EYELIDS.

The eyelids are torn by attacks with horns of cattle, or with the teeth, or by getting caught on nails in stall rack or manger, on the point of stump fences or fence rails, on the barbs of wire-fences and on other pointed bodies. The edges should be brought together as promptly as possible, so as to secure union without the formation of matter, puckering of the skin, and unsightly distortions. Great care is necessary to bring the two edges together evenly without twisting or puckering. The simplest mode of holding them together is by a series of sharp pins passed through the lips of the wound at intervals of not over a third of an inch, and held together by a thread twisted around each pin in the form of the figure 8, and carried obliquely from pin to pin in two directions, so as to prevent gaping of the wound in the intervals. The points of the pins may then be cut off with scissors, and the wound may be wet twice a day with a weak solution of carbolic acid.

TUMOR OF THE HAW—CARIES OF THE CARTILAGE.

Though cruelly excised for alleged "hooks," when itself perfectly healthy in the various diseases which lead to retraction of the eye into its socket, the haw may, like other bodily structures, be itself the seat of actual disease. The pigmentary black tumors of white horses and

soft (encephaloid) cancer may attack this part primarily or extend to it from the eyeball or eyelids; hairs have been found growing from its surface; and the mucous membrane covering it becomes inflamed in common with that covering the front of the eye. These inflammations are but a phase of the inflammation of the external structures of the eye, and demand no particular notice nor special treatment. The tumors lead to such irregular enlargement and distortion of the haw that the condition is not to be confounded with the simple projection of the healthy structure over the eye when the lids are pushed apart with the finger and thumb, and the same remark applies to the ulceration or caries of the cartilage. In the latter case, besides the swelling and distortion of the haw, there is this peculiarity, that in the midst of the red inflamed mass there appears a white line or mass formed by the exposed edge of the ulcerating cartilage. The animal having been thrown and properly fixed, an assistant holds the eyelids apart while the operator seizes the haw with forceps or hook and carefully dissects it out with blunt-pointed scissors. The eye is then covered with a cloth kept wet with an eye wash, as for external ophthalmia.

OBSTRUCTION OF THE LACHRYMAL APPARATUS—WATERING EYE.

The escape of tears on the side of the cheek is a symptom of external inflammation of the eye, but it may also occur from any disease of the lachrymal apparatus which interferes with the normal progress of the tears to the nose. Hence, in all cases when this symptom is not attended by special redness or swelling of the eyelids, it is well to examing the lachrymal apparatus. In some instances the orifice of the lachrymal duct on the floor of the nasal chamber and close to its anterior outlet will be found blocked by a portion of dry muco-purulent matter, on the removal of which tears may begin to escape. This implies an inflammation of the canal, which may be helped by occasional sponging out of the nose with warm water, and the application of the same on the face. Another remedy is to feed warm mashes of wheat bran from a nose-bag, so that the relaxing effects of the water vapor may be secured.

The two lachrymal openings, situated at the inner angle of the eye, may fail to admit the tears by reason of their deviation outward in connection with eversion of the lower lid, or by reason of their constriction in inflammation of the mucous membrane. The lachrymal sac, into which the lachrymal ducts open, may fail to discharge its contents by reason of constriction or closure of the duct leading to the nose, and it then forms a rounded swelling beneath the inner angle of the eye. The duct leading from the sac to the nose may be compressed or obliterated by fractures of the bones of the face, and in disease of these bones (osteo-sarcoma, so-called osteoporosis, diseased teeth, glanders of the nasal sinuses, abscess of the same cavities).

The narrowed or obstructed ducts may be made pervious by a fine silver probe passed down to the lachrymal sac, and any existing inflammation of the passages may be counteracted by the use of steaming mashes of wheat bran, by fomentations or wet cloths over the face, and even by the use of astringent eye washes and the injection of similar liquids into the lachrymal canal from its nasal opening. The ordinary eye wash may be used for this purpose, or it may be injected after dilution to half its strength. The fractures and diseases of the bones and teeth must be treated according to their special demands when, if the canal is still left pervious, it may be again rendered useful.

EXTERNAL OPHTHALMIA—CONJUNCTIVITIS.

In inflammation of the outer parts of the eye ball the exposed vascular and sensitive mucous membrane (conjunctiva) which covers the ball, the eyelids, the haw, and the lachrymal apparatus, is usually the most deeply involved, yet adjacent parts are more or less implicated, and when disease is concentrated on these contiguous parts it constitutes a phase of external ophthalmia which demands a special notice. These have accordingly been already treated of.

The *causes* of external ophthalmia are mainly those that act locally—blows with whips, clubs, and twigs, the presence of foreign bodies like hay-seed, chaff, dust, lime, sand, snuff, pollen of plants, flies attracted by the brilliancy of the eye, wounds of the bridle, the migration of the scabies (mange) insect into the eye, smoke, ammonia rising from the excretions, irritant emanations from drying marshes, etc. A very dry air is alleged to act injuriously by drying the eye as well as by favoring the production of irritant dust; and the undue exposure to bright sunshine through a window in front of the stall, or to the reflection from snow or water, is undoubtedly injurious. The unprotected exposure of the eyes to sunshine through the use of a very short overdraw check is to be condemned, and the keeping of the horse in a very dark stall from which it is habitually led into the glare of full sunlight, intensified by reflection from snow or white limestone dust, must be set down among the locally acting causes. But exposure to cold and wet, to rain and snow storms, to cold draughts and wet lairs must also be accepted as causes of conjunctivitis, the general disorder which they produce affecting the eye, if that happens to be the weakest and most susceptible organ of the body, or if it has been subjected to any special local injury like dust, irritant gases, or excess of light. Again, external ophthalmia is a constant concomitant of inflammation of the contiguous and continuous mucous membranes, as those of the nose and throat. Hence the red watery eyes that attend on nasal catarrh, sore throat, influenza, strangles, nasal glanders, and the like. In such cases, however, the affection of the eye is subsidiary and is manifestly overshadowed by the primary and predominating disease.

The *symptoms* are watering of the eye, swollen lids, redness of the mucous membrane exposed by the separation of the lids—it may be a mere pink blush with more or less branching redness, or it may be a deep, dark red, as from effusion of blood—and a bluish opacity of the cornea which is normally clear and translucent. But except when resulting from wounds and actual extravasation of blood, the redness is seen to be superficial, and if the opacity is confined to the edges, and does not involve the entire cornea the aqueous humor behind is seen to be still clear and limpid. The fever is always less severe than in internal ophthalmia, and only runs high in the worst cases. The eyelids may be kept closed, the eye-ball retracted, and the haw protruded over one-third or one-half of the ball, but this is due to the pain only and not to any excessive sensibility to light, as shown by the comparatively widely dilated pupil. In internal ophthalmia, on the contrary, the narrow contracted pupil is the measure of the pain caused by the falling of light on the inflamed and sensitive optic nerve (retina) and choroid.

If the affection has resulted from a wound of the cornea, not only is that the point of greatest opacity, forming a white speck or fleecy cloud, but too often blood-vessels begin to extend from the adjacent vascular covering of the eye (sclerotic) to the white spot, and that portion of the cornea is rendered permanently opaque. Again, if the wound has been severe, though still short of cutting into the anterior layers of the cornea, the injury may lead to ulceration which may penetrate more or less deeply and leave a breach in the tissue which, if filled up at all, is repaired by opaque fibrous tissue in place of the transparent cellular structure. Pus may form, and the cornea assumes a yellowish tinge and bursts, giving rise to a deep sore which is liable to extend as an ulcer, and may be in its turn followed by bulging of the cornea at that point (staphyloma). This inflammation of the conjunctiva may be simply catarrhal, with profuse muco-purulent discharge; it may be granular, the surface being covered with minute reddish elevations, or it may become the seat of a false membrane (diphtheria).

In *treating* external ophthalmia the first object is the removal of the cause. Remove any dust, chaff, thorn, or other foreign body from the conjunctiva, purify the stable from all sources of ammoniacal or other irritant gas; keep the horse from dusty roads, and above all from the proximity of a leading wagon and its attendant cloud of dust; remove from pasture and feed from a rack which is neither so high as to drop seeds, etc., into the eyes nor so low as to favor the accumulation of blood in the head; avoid equally excess of light from a sunny window in front of the stall and excess of darkness from the absence of windows; preserve from cold draughts and rains and wet bedding, and apply curative measures for inflammation of the adjacent mucous membranes or skin. If the irritant has been of a caustic nature remove any remnant of it by persistent bathing with tepid water and a soft sponge, or with water mixed with white of egg, or a glass filled with

the liquid may be inverted over the eye so that its contents may dilute and remove the irritant. If the suffering is very severe a lotion with a few grains of extract of belladonna or of morphia in an ounce of water may be applied, or if it is available a few drops of 4 per cent. solution of cocaine may be instilled into the eye.

In strong, vigorous patients benefit will usually be obtained from a laxative, such as 2 tablespoonfuls of Glauber's salts daily, and if the fever runs high from a daily dose of half an ounce of saltpeter. As local applications astringent solutions are usually the best, as 30 grains of borax or of sulphate of zinc in a quart of water, to be applied constantly on a cloth, as advised, under inflammation of the eyelids. In the absence of anything better cold water may serve every purpose. Above all, adhesive and oily agents (molasses, sugar, fats) are to be avoided, as only adding to the irritation. By way of suggesting agents that may be used with good effect, salt and sulphate of soda may be named, in solutions double the strength of sulphate of zinc, or 7 grains of nitrate of silver may be added to a quart of distilled water, and will be found especially applicable in granular conjunctivitis, diphtheria, or commencing ulceration. A cantharides blister (1 part of Spanish fly to 4 parts lard) may be rubbed on the side of the face 3 inches below the eye, and washed off next morning with soap-suds and oiled daily till the scabs are dropped.

WHITE SPECKS AND CLOUDINESS OF THE CORNEA.

As a result of external ophthalmia, opaque specks, clouds, or haziness are too often left on the cornea and require for their removal that they be daily touched with a soft feather dipped in a solution of 3 grains nitrate of silver in 1 ounce distilled water. This should be applied until all inflammation has subsided, and until its contact is comparatively painless. It is rarely successful with an old thick scar following an ulcer, nor with an opacity having red blood-vessels running across it.

ULCERS OF THE CORNEA.

These may be treated with nitrate of silver lotion of twice the strength used for opacities. Powdered gentian, one-half ounce, and sulphate of iron, one-fourth ounce daily, may improve the general health and increase the reparatory power.

INTERNAL OPHTHALMIA—IRITIS—CHOROIDITIS—RETINITIS.

Although inflammations of the iris, choroid, and retina, the inner vascular and nervous coats of the eye occur to a certain extent independently of each other, yet one usually supervenes upon the other, and as the symptoms are thus made to coincide it will be best for our present purposes to treat the three as one disease.

The *causes* of internal ophthalmia are largely those of the external form only, acting with greater intensity or on a more susceptible eye. Severe blows, bruises, punctures, etc., of the eye, the penetration of foreign bodies into the eye (thorns, splinters of iron, etc.), sudden transition from a dark stall to bright sunshine, to the glare of snow or water, constant glare from a sunny window, abuse of the overdraw check-rein, vivid lightning flashes, draughts of cold, damp air; above all, when the animal is perspiring, exposure in cold rain and snowstorms, swimming cold rivers, also certain general diseases like rheumatism, arthritis, influenza, and disorders of the digestive organs, may become complicated by this affection. From the close relation between the brain and eye—alike in the blood vessels and nerves—disorders of the first lead to affections of the second, and the same remark applies to the persistent irritation to which the jaws are subjected in the course of dentition. So potent is the last agency that we dread a recurrence of ophthalmia so long as dentition is incomplete, and hope for immunity if the animal completes its dentition without any permanent structural change in the eye.

The *symptoms* will vary according to the cause. If the attack is due to direct physical injury the inflammation of the eyelids and superficial structures may be quite as marked as that of the interior of the eye. If, on the other hand, from general causes, or as a complication of some distant disease, the affection may be largely confined to the deeper structures, and the swelling, redness, and tenderness of the superficial structures will be less marked. When the external coats thus comparatively escape the extreme anterior edge of the white or sclerotic coat where it overlaps the border of the transparent cornea is in a measure free from congestion, and, in the absence of the obscuring dark pigment, forms a whitish ring around the cornea. This is partly due to the fact that a series of arteries (ciliary) passing to the inflamed iris penetrate the sclerotic coat a short distance behind its anterior border, and there is therefore a marked difference in color between the general sclerotic occupied by these congested vessels and the anterior rim from which they are absent. Unfortunately the pigment is often so abundant in the anterior part of the sclerotic as to hide this symptom. In internal ophthalmia the opacity of the cornea may be confined to a zone around the outer margin of the cornea, and even this may be a bluish haze rather than a deep fleecy white. In consequence it becomes possible to see the interior of the chamber for the aqueous humor and the condition of the iris and pupil. The aqueous humor is usually turbid, and has numerous yellowish white flakes floating on its substance or deposited in the lower part of the chamber, so as to cut off the view of the lower portion of the iris. The still visible portion of the iris has lost its natural, clear dark luster, which is replaced by a brownish or yellowish sere-leaf color. This is more marked in proportion as the iris is inflamed, and less so as the inflammation is confined to the cho-

roid. The amount of flocculent deposit in the chamber of the aqueous humor is also in direct ratio to the inflammation of the iris. Perhaps the most marked feature of internal ophthalmia is the extreme and painful sensitiveness to light. On this account the lids are usually closed, but when opened the pupil is seen to be narrowly closed even if the animal has been kept in an obscured stall. Exceptions to this are seen when inflammatory effusion has overfilled the globe of the eye, and by pressure on the retina has paralyzed it, or when the exudation into the substance of the retina itself has similarly led to its paralysis. Then the pupil may be dilated, and frequently its margin loses its regular ovoid outline and becomes uneven by reason of the adhesions which it has contracted with the capsule of the lens, through its inflammatory exudations. In the case of excessive effusion into the globe of the eye that is found to have become tense and hard so that it can not be indented with the tip of the finger. With such paralysis of the retina, vision is heavily clouded or entirely lost, hence in spite of the open pupil the finger may be approached to the eye without the animal becoming conscious of it until it touches the surface, and if the nose on the affected side is gently struck and a feint made to repeat the blow the patient makes no effort to evade it. Sometimes the edges of the contracted pupil become adherent to each other by an intervening plastic exudation, and the opening becomes virtually abolished. In severe inflammations pus may form in the choroid or iris, and escaping into the cavity of the aqueous humor show as a yellowish white stratum below. In nearly all cases there is resulting exudation into the lens or its capsule, constituting a cloudiness or opacity (cataract), which in severe and old standing cases appears as a white fleecy mass behind a widely dilated pupil. In the slighter cases cataract is to be recognized by examination of the eye in a dark chamber, with an oblique side light as described in the introduction to this article. Cataracts that appear as a simple haze or indefinite fleecy cloud are usually on the capsule (capsular), while those that show a radiating arrangement are in the lens (lenticular), the radiating fibers of which the exudate follows. Black cataracts are formed by the adhesion of the pigment on the back of the iris to the front of the lens, and by the subsequent tearing loose of the iris, leaving a portion of its pigment adherent to the capsule of the lens. If the pupil is so contracted that it is impossible to see the lens, it may be dilated by applying to the front of the eye with a feather some drops of a solution of 4 grains of atropia in an ounce of water.

The *treatment* of internal ophthalmia should embrace first the removal of all existing causes, or sources of aggravation, of the disease, which need not be here repeated. Special care to protect the patient against cold, wet, strong light, and active exertion, must, however, be specially insisted on. A dark stall, and a cloth hung over the eye, are important, while cleanliness, warmth, dryness, and rest are equally demanded. If the patient is strong and vigorous a dose of 4 drams of Barbadoes aloes

may be given, and, if there is any reason to suspect a rheumatic origin, one-half a dram powdered colchicum and one-half ounce salicylate of soda may be given daily. Locally the astringent lotions advised for external ophthalmia may be resorted to, especially when the superficial inflammation is well marked. More important, however, is to instill into the eye, a few drops at a time, a solution of 4 grains of atropia in 1 ounce distilled water. This may be effected with the aid of a soft feather, and may be repeated at intervals of ten minutes until the pupil is widely dilated. As the horse is to be kept in a dark stall the consequent admission of light will be harmless, and the dilation of the pupil prevents adhesions between the iris and lens, relieves the constant tension of the eye in the effort to adapt the pupil to the light, and solicits the contraction of the blood vessels of the eye and the lessening of congestion, exudation, and intraocular pressure. Should atropia not agree with the case, it may be replaced by morphia (same strength) or cocaine, in 4 per cent. solution. Another local measure is a blister, which can usually be applied to advantage on the side of the nose or beneath the ear. Spanish flies may be used as for external ophthalmia. In very severe cases the parts beneath the eye may be shaved and three or four leeches applied. Setons are sometimes beneficial, and even puncture of the eye-ball, but these should be reserved for professional hands.

The diet throughout should be easily digestible and moderate in quantity—bran mashes, middlings, grass, steamed hay, etc.

Even after the active inflammation has subsided the atropia lotion should be continued for some weeks to keep the eye in a state of rest in its still weak and irritable condition, and during this period the patient should be kept in semi-darkness, or taken out only with a dark shade over the eye. For the same reason heavy draughts and rapid paces, which would cause congestion of the head, should be carefully avoided.

RECURRENT OPHTHALMIA—PERIODIC OPHTHALMIA—MOONBLINDNESS.

This is an inflammatory affection of the interior of the eye, intimately related to certain soils, climates, and systems, showing a strong tendency to recur again and again and usually ending in blindness from cataract or other serious injury.

Its *causes* may be fundamentally attributed to soil. On damp clays and marshy grounds, on the frequently overflowed river bottoms and deltas, on the coasts of seas and lakes alternately submerged and exposed, this disease prevails extensively, and in many instances in France (Reynal), Belgium, Alsace (Zundel Miltenberger), Germany, and England it has very largely decreased under land drainage and improved methods of culture. Other influences, more or less associated with such soil, are potent causative factors. Thus damp air and a cloudy, wet

climate, so constantly associated with wet lands, are universally charged with causing the disease. These act on the animal body to produce a lymphatic constitution with an excess of connective tissue, bones, and muscles of coarse open texture, thick skins and gummy legs covered with a profusion of long hair. Hence the heavy horses of Belgium and southwestern France have suffered severely from the affection, while high dry lands adjacent, like Catalonia in Spain, and Dauphiny, Provence, and Languedoc, in France, have in the main escaped.

The rank aqueous fodders grown on such soils are other causes, but these again are calculated to undermine the characters of the nervous and sanguineous temperament, and to superinduce the lymphatic. Other foods act by leading to constipation and other disorders of the digestive organs, thus impairing the general health; hence in any animal predisposed to this disease, heating, starchy foods, such as maize, wheat, and buckwheat are to be carefully avoided. It has been widely charged that beans, peas, vetches, and other leguminosa are dangerous, but a fuller inquiry contradicts this. If these are well grown they invigorate and fortify the system, while like any other fodder if grown rank, aqueous, and deficient in assimilable principles they tend to lower the health and open the way for the disease.

The period of dentition and training is a fertile exciting cause, for though the malady may appear at any time from birth to old age, yet the great majority of victims are from two to six years old, and if a horse escapes the affection till after six there is a reasonable hope that he will continue to resist it. The irritation about the head during the eruption of the teeth, and while fretting in the unwonted bridle and collar, the stimulating grain diet and the close air of the stable all combine to rouse the latent tendency to disease in the eye, while direct injuries by bridle, whip, or hay-seeds are not without their influence.

In the same way local irritants like dust, severe rain and snow-storms, smoke and acrid vapors are contributing causes.

It is evident, however, that no one of these is sufficient of itself to produce the disease, and it has been alleged that the true cause is a microbe, or the irritant products of a microbe, which is harbored in the marshy soil. The prevalence of the disease on the same damp soils which produce ague in man and anthrax in cattle has been quoted in support of this doctrine, as also the fact that the malady is always more prevalent *cæteris paribus* in basins surrounded by hills where the air is still and such products are concentrated, and that a forest or simple belt of trees will, as in ague, at times limit the area of its prevalence. Another argument for the same view is found in the fact that on certain farms irrigated by town sewage this malady has become extremely prevalent, the sewage being assumed to form a suitable nidus for the growth of the germ. But on these sewage farms a fresh crop may be cut every fortnight, and the product is precisely that aqueous material which contributes to a lymphatic structure and a low tone

of health. The presence in the system of a definite germ has not yet been proven, and in the present state of our knowledge we are only warranted in charging the disease on the deleterious emanations from the marshy soil in which bacterial ferments are constantly producing them.

Heredity is one of the most potent causes. The lymphatic constitution is of course transmitted and with it the proclivity to recurring ophthalmia. This is notorious in the case of both parents, male and female. The tendency appears to be stronger, however, if either parent has already suffered. Thus a mare may have borne a number of sound foals, and then fallen a victim to this malady, and all foals subsequently borne have likewise suffered. So with the stallion. Reynal even quotes the appearance of the disease in alternate generations, the stallion offspring of blind parents remaining sound through life and yet producing foals which furnish numerous victims of recurrent ophthalmia. On the contrary, the offspring of diseased parents removed to high, dry regions and furnished with wholesome, nourishing rations, will nearly all escape. Hence the dealers take colts that are still sound or have had but one attack from the affected low Pyrenees (France) to the unaffected Catalonia (Spain), with confidence that they will escape, and from the Jura Valley to Dauphiny with the same result.

Yet the hereditary taint is so strong and pernicious that intelligent horsemen everywhere refuse to breed from either horse or mare that has once suffered from recurrent ophthalmia, and the French Government studs not only reject all unsound stallions, but refuse service to any mare which has suffered with her eyes. It is this avoidance of the hereditary predisposition more than anything else that has reduced the formerly wide prevalence of this disease in the European countries generally. A consideration for the future of our horses would demand the disuse of all sires that are unlicensed, and the refusal of a license to any sire which has suffered from this or ony other communicable constitutional disease.

Other contributing causes deserve passing mention. Unwholesome food and a faulty method of feeding undoubtedly predisposes to the disease, and in the same district the carefully fed will escape in far larger proportion than the badly fed. But it is so with every other condition which undermines the general health. The presence of worms in the intestines, overwork, and debilitating diseases and causes of every kind weaken the vitality and lay the system more open to attack. Thierry long ago showed that the improvement of close, low, dark, damp stables, where the disease had previously prevailed, practically banished this affection. Whatever contributes to strength and vigor is protective—whatever contributes to weakness and poor health is provocative of the disease in the predisposed subject.

The *symptoms* vary according to the severity of the attack. In some cases there is marked fever, and in other slighter cases this may be

almost altogether wanting, but there is always a lack of vigor and energy, bespeaking general disorder. The local symptoms are in the main those of internal ophthalmia, with, in many cases, an increased hardness of the eye-ball from effusion into its cavity. The contracted pupil does not expand much in darkness, nor even under the action of belladonna. Opacity advances from the margin, over a part or whole of the cornea, but so long as it is transparent there may be seen the turbid aqueous humor with or without flocculi, the dingy iris robbed of its clear black aspect, the slightly clouded lens and a greenish yellow reflection from the depth of the eye. From the fifth to the seventh day the flocculi precipitates in the lower part of the chamber, exposing more clearly the iris and lens, and absorption commences so that the eye may be cleared up in ten or fifteen days.

The characteristic of the disease is, however, its recurrence again and again in the same eye until blindness results. The attacks may follow each other at intervals of a month, more or less, but they show no relation to any particular phase of the moon as might be inferred from the familiar name, but are determined rather by the weather, the health, the food, or by some periodicity of the system. From five to seven attacks usually result in blindness, and then the second eye is liable to be attacked until it also is ruined.

In the intervals between the attacks some remaining symptoms betray the condition, and these become more marked after each successive access of disease. Even after the first attack there is a bluish ring round the margin of the transparent cornea. The eye seems smaller than the other, at first because it is retracted in its socket, and often after several attacks because of actual shrinkage (atrophy). The upper eyelid, in place of presenting a uniform, continuous arch, has about one-third from its inner angle an abrupt bend, caused by the contraction of the levator muscle. The front of the iris has exchanged some of its dark, clear brilliancy for a lusterless yellow, and the depth of the eye presents more or less of the greenish yellow shade. The pupil remains a little contracted, except in advanced and aggravated cases, when, with opaque lens, it is widely dilated. If one eye only has suffered, as is common, the contrast in these respects with the sound eye is all the more characteristic. Another feature is the erect, attentive carriage of the ear, to compensate to some extent for the waning vision.

The attacks vary greatly in severity in different cases, but the recurrence is characteristic, and all alike lead to cataract and intraocular effusion, with pressure on the retina and abolition of sight.

The *prevention* of this disease is the great object to be aimed at, and this demands the most careful breeding, feeding, housing, and general management as indicated under causes. Much can also be done by migration to a high, dry location, but for this and malarious affections the improvement of the land by drainage and good cultivation should be the final aim.

Treatment is not satisfactory, but is largely the same as for common internal ophthalmia. Some cases, like rheumatism, are benefited by scruple doses of powdered colchicum and 2-dram doses of salicylate of soda twice a day. In other cases with marked hardness of the globe of the eye from intraocular effusion, puncture of the eye, or even the excision of a portion of the iris, has helped. During recovery a course of tonics (2 drams oxide of iron, 10 grains nux vomica, and 1 ounce sulphate of soda daily) is desirable to invigorate the system and help to ward off another attack. The vulgar resort to knocking out the wolf-teeth and cutting out the haw can only be condemned. The temporary recovery would take place in one or two weeks though no such thing had been done, and the breaking of a small tooth, leaving its fang in the jaw, only increases the irritation.

CATARACT.

The common result of intern al ophthalmia, as of the recurrent type, may be recognized as described under the first of these diseases. Its offensive appearance may be obviated by extraction or depression of the lens, but as the rays of light would no longer be properly refracted, perfect vision would not be restored, and the animal would be liable to prove an inveterate shyer. If perfect blindness continued by reason of pressure on the nerve of sight, no shying would result.

PALSY OF THE NERVE OF SIGHT—AMAUROSIS.

The *causes* of this affection are tumors or other disease of the brain implicating the roots of the optic nerve; injury to the nerve between the brain and eye; and inflammation of the optic nerve within the eye (retina), or undue pressure on the same from dropsical or inflammatory effusion. It may also occur from overloaded stomach, from a profuse bleeding, and even from the pressure of the gravid womb in gestation.

The symptoms are wide dilatation of the pupils, so as to expose fully the interior of the globe, the expansion remaining the same in light and darkness. Ordinary eyes when brought to the light have the pupils suddenly contract, and then dilate and contract alternately until they adapt themselves to the amount of light. The horse does not swerve when a feint to strike is made unless the hand causes a current of air. The ears are held erect and turn quickly toward any noise, and the horse steps high to avoid stumbling over objects which it can not see.

Treatment is only useful when the disease is symptomatic of some removable cause, like congested brain, loaded stomach, or gravid womb. When recovery does not follow the termination of these conditions, apply a blister behind the ear and give one-half dram doses of nux vomica daily.

TUMORS OF THE EYEBALL.

A variety of tumors attack the eyeball—dermoid, papillary, fatty, cystic, and melanotic, but perhaps the most frequent in the horse is encephaloid cancer. This may grow in or on the globe, the haw, the eyelid, or the bones of the orbit, and is only to be remedied if at all by early and thorough excision. It may be distinguished from the less dangerous tumors by its softness, friability, and great vascularity, bleeding on the slightest touch, as well as by its anatomical structure.

STAPHYLOMA.

This consists in a bulging forward of the cornea at a given point by the saccular yielding and distension of its coats, and it may be either transparent or opaque and vascular. In the last form the iris has become adherent to the back of the cornea, and the whole structure has become filled with blood-vessels. In the first form the bulging cornea is attenuated; in the last it may be thickened. The best treatment is by excision of a portion of the iris so as to relieve the intra-ocular pressure.

PARASITES IN THE EYE.

Acari in the eye have been incidentally alluded to under inflammation of the lids.

The *Filaria lachrymalis* is a white worm, one-half to 1 inch long, which inhabits the lachrymal duct and the under side of the eyelids and haw in the horse, producing a verminous conjunctivitis. The first step in treatment in such cases is to remove the worm with forceps, then treat as for external inflammation.

The *Filaria papillosa* is a delicate, white, silvery-looking worm, which I have repeatedly found 2 inches in length. It invades the aqueous humor, where its constant active movements make it an object of great interest, and it is frequently exhibited as a "snake in the eye." It is found also in other internal cavities of the horse, to which it undoubtedly makes its way from the food, and especially the water swallowed, and its prevention is therefore to be sought mainly in the supply of pure water from close deep wells. When present in the eye it causes inflammation and has to be removed through an incision made with the lancet in the upper border of the cornea close to the sclerotic, the point of the instrument being directed slightly forward to avoid injury to the iris. Then apply cold water or astringent lotions.

The *echinococcus*, the cystic or larval stage of the echinococcus tapeworm of the dog, has been found in the eye of the horse and a cysticercus (*Cysticercus fistularis ?*) is also reported.

The *Pentastoma tænioides*, which inhabits the nose of horse and dog, has been found by Stitten in the eye of the horse, but the case is unique.

PLATE XIX.

Theoretical Section of the Horse's Eye.

a, Optic nerve; b, Sclerotic; c, Choroid; d, Retina; e, Cornea, f, Iris; g,h, Ciliary circle, (or ligament) and processes given off by the choroid, though represented as isolated from it, in order to indicate their limits more clearly; i, Insertion of the ciliary processes on the crystalline lens; j, Crystalline lens; k, Crystalline capsule; l, Vitreous body; m,n, Anterior and posterior chambers; o, Theoretical indication of the membrane of the aqueous humour; p,p, Tarsi, q,q, Fibrous membrane of the eyelids; r, Elevator muscle of the upper eyelid; s,s, Orbicularis muscle of the eyelids; t,t, Skin of the eyelids; u, Conjunctiva; v, Epidermic layer of this membrane covering the Cornea, x, Posterior rectus muscle; y, Superior rectus muscle; z, Inferior rectus muscle; w, Fibrous sheath of the orbit (or orbital membrane).

Geo. Marx, after D'Arboval, p. 371.

Sachen & Wilhelmi Lith. Co. N.Y.

DIAGRAMATIC VERTICAL SECTION THROUGH EYE.

LAMENESS.--ITS CAUSES AND TREATMENT.

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The consideration of the usefulness and consequently of the value to their human masters of those of the inferior animals which are classed as beasts of burden ultimately and naturally resolves itself into an inquiry into the condition of that special portion of their organism which controls the function of locomotion, for it is only as living, organized locomotive machines that the horse, the camel, the ox, and their burden-bearing companions are of practical value to man. This is especially true in regard to the members of the equine family, the most numerous and valuable of them all, and it naturally follows that with the horse for a subject of discussion the special topic and leading theme of inquiry will, by an easy lapse, become an inquest into the condition and efficiency of his power for usefulness as a carrier or traveler. There is a large amount of abstract interest in the study of that endowment of the animal economy which enables its possessor to change his place at will and convey himself whithersoever his needs or his moods may incline him; but how much greater the interest that attaches to the subject when it becomes a practical and economic question and includes within its purview the various related topics which belong to the domains of physiology, pathology, therapeutics, and the entire round of scientific investigation into which it is finally merged as a subject for medical and surgical consideration, in a word, of actual disease and its treatment. It is not surprising that the intricate and complicated apparatus of locomotion, with its symmetry and harmony of movement and the perfection and beauty of its details and adjuncts, should be admiringly denominated by students of creative design and attentive observers of nature and her marvelous contrivances and adaptations a *living machine.*

The horse in a state of domesticity is of all the animal tribe the largest sharer with his master in his liability to the accidents and dangers which are among the incidents of civilized life. From his exposure to the missiles of war on the battle-field to his chance of picking up a nail from the city pavement there is no hour when he is not in danger of

incurring injuries which may demand the best skill of the veterinarian practitioner to repair. And this is not alone true of casualties which belong to the class of external and traumatic cases, but includes as well those of a kind perhaps more numerous, which may result in lesions of internal parts, frequently the most serious and obscure of all in their nature and effects.

The horse is too important a factor in the practical details of human life and fills too large a place in the business and pleasure of the world to justify any indifference to his needs and his physical comfort or neglect in respect to the preservation of his peculiar powers for usefulness. In this connection it is hardly necessary to allude to sentimental considerations of "humanity," so called—a word which too often becomes a wretched misnomer when one recalls the neglects, the mistreatment, the overtasking and other cruelties, in many instances tortures, of which he becomes the helpless victim. In entering somewhat largely, therefore, upon a review of the subject, and treating in detail of the causes, the symptoms, the progress, the treatment, the results, and the consequences of *lameness in the horse*, we are performing a duty which needs no word of apology or justification. The subject explains and justifies itself, and is its own vindication and illustration if any are needed.

The function of locomotion is performed by the action of two principal systems of organs, known in anatomical and physiological terminology as *passive* and *active*, the *muscles* performing the *active* and the *bones* the *passive* portion of the movement, the necessary connection between the co-operating organism being effected by means of a vital contact by which the muscle is attached to the bone at certain determinate points on the surface of the latter. These points of attachment appear in the form of sometimes an eminence, sometimes a depression, sometimes a border or an angle, or again as a mere roughness, but each perfectly fulfilling its purpose, while the necessary motion is provided for by the formation of the ends of the long bones into the requisite articulations, joints, or hinges. Every motion is the product of the contraction of one or more of the muscles, which, as it acts upon the bony levers, gives rise to a movement of extension or flexion, abduction or adduction, rotation or circumduction. The movement of abduction is that which passes from and that of adduction that which passes towards the median line, or the center of the body. The movements of flexion and extension are too well understood to need defining. It is the combination and rapid alternations of these movements which produce the different postures and various gaits of the living animal, and it is their interruption and derangement, from whatsoever cause, which constitutes the pathological condition of *lameness*.

A concise examination of the general anatomy of these organs, however, must precede the consideration of the pathological questions pertaining to the subject. A statement such as we have just given, con-

taining only the briefest hint of matters which, though not necessarily in their ultimate scientific minutiæ, must be clearly comprehended in order to acquire a symmetrical and satisfactory view of the theme as a practical collation of facts to be remembered, analyzed, applied, and utilized.

It was the great Bacon who wrote: "The human body may be compared, from its complex and delicate organization, to a musical instrument of the most perfect construction, but exceedingly liable to derangement." In its degree the remark is equally applicable to the equine body, and if we would keep it in tune and profit by its harmonious action we must at least acquaint ourselves with the relations of its parts and the mode of their co-operation.

ANATOMY.

The bones, then, are the hard organs which in their connection and totality constitute the skeleton of an animal. They are of various forms, of which three—the long, the flat, and the small—are recognized in the extremities. These are more or less regular in their form, but present upon their surfaces a variety of aspects, exhibiting in turn, according to the requirement of each case, a roughened or smooth surface, variously marked with grooves, crests, eminences and depressions, for the necessary muscular attachments, and, as before mentioned, are connected by articulations and joints, of which some are immovable and others of a movable kind.

The substance of the bones is composed of a mass of combined earthy and animal matter, surrounded by a fine, fibrous enveloping membrane (the periosteum) which is intimately adherent to the external surface of the bone, and is, in fact, the secreting membrane of the bony structure. The bony tissue proper is of two consistences, the external portion being hard and "compact," and called by the latter term, while the internal, known as the "spongy tissue" or "areolar," is also of a consistency corresponding with these descriptive terms. Those of the bones which possess this latter consistency contain also, in their spongy portion, the medullary substance known as *marrow*, which is deposited in large quantities in the interior of the long bones, and especially where a central cavity exists, called, for that reason, the medullary cavity. The nourishment of the bones is effected by means of what is known as the *nutrient foramen*, which is an opening established for the passage of the blood vessels which convey the necessary nourishment to the interior of the organ. There are other minutiæ concerning the nourishment of the skeleton, such as the venous arrangement and the classification of their arterial vessels into several orders, which, though of interest as an abstract study, are not of sufficient practical value to refer to here.

The active organs of locomotion, the *muscles*, form, speaking generally, the fleshy covering of the external part of the skeleton and sur-

round the bones of the extremities. They vary greatly in shape and size, being flat, triangular, long, short, or broad, and are variously and capriciously named, some from their shape, some from their situation, and others from their use, and thus we have abductors and adductors, the pyramidal and orbicular, the digastricus, the vastus, and the rest. Those which are under the control of the will, known as the voluntary muscles, appear in the form of fleshy structures, red in color, and with fibers of various degrees of fineness, and are composed of "*fasciculi*," or bundles of fibers, united by connective or cellular tissue, each fasciculus being composed of smaller ones, less in size, but united in a similar manner to compose the larger formations, each of which is enveloped by a structure of similar nature known as the *sarcolemma*. Many of the muscles are united to the bones by the direct contact of their fleshy fibers, but, in other instances, the body of the muscle is more or less gradually transformed into a cordy or membranous structure known as the tendon or sinew, and the attachment is made by very short fibrous threads through the medium of a long tendinous band, which, passing from a single one to several other of the bones, effects its object at a point far distant from its original attachment. In thus carrying its action from one bone to another, or from one region of a limb to another, these tendons must necessarily have smooth surfaces over which to glide, either upon the bones themselves or formed at their articulations, and this need is supplied by the secretion of the synovial fluid, a yellowish, unctuous substance, furnished by a peculiar tendinous synovial sac, designed for the purpose.

Illustrations in point of the agency of the synovial fluid in assisting the sliding movements of the tendons may be found under their various forms at the shoulder joint, at the upper part of the bone of the arm, at the posterior part of the kneejoint, and also at the fetlocks, on their posterior part.

As the tendons, whether singly or in company with others, pass over these natural pullies they are retained in place by strong fibrous bands or sheaths, which are by no means exempt from danger of injury, as will be readily inferred from a consideration of their important special use as supports and reënforcements of the tendons themselves, with which they must necessarily share the stress of whatever force or strain is brought to bear upon both or either.

We have referred to that special formation of the external surface of a bone by which it is adapted to form a joint or articulation, either movable or fixed, and a concise examination of the formation and structure of the movable articulations will here be in place. These are formed generally by the extremities of the long, or they may exist on the surfaces of the short bones; the points or regions where the contact occurs being denominated the articular surface, which assumes from this circumstance a considerable variety of aspect and form, being in one case comparatively flat and at another elevated; or as forming a pro-

truding head or knob, with a distinct convexity; and again presenting a corresponding depression or cavity, accurately adapted to complete, by their coaptation, the ball and socket joint. The articulation of the arm and shoulder is an example of the first kind, while that of the hip with the thigh bone is a perfect exhibition of the latter.

The structure, whose office is the retention of the articulation in place, is the *ligament.* This is a white, inelastic, or yellowish texture, possessing in some degree the opposite quality. In some instances it is of a corded or funicular shape, but consists in others of a broad membrane, in the first form serving to bind the bones more firmly together, and in the latter surrounding or inclosing, in whole or in part, the broad articulations, and calculated rather for the protection of the cavity from intrusion by the air than for other security. These latter are usually found in connection with those of the joints which possess a free and extended movement, but are also found accompanying the funicular ligaments either surrounding and inclosing the joints or occupying the interior of their structure, as *interarticular*, in which situation they secure the union of the several bones more firmly and effectively than would be possible for the capsular ligament unassisted.

The universal need which pertains to all mechanical contrivances of motion has not been forgotten while providing for the perfect working of the interesting piece of living machinery which performs the function of locomotion, as we are contemplating it, and nature has consequently provided for obviating the evils of attrition and friction, and insuring the easy play and smooth movement of its parts, by the establishment of the secretion of the *synovia*, the vital lubricant of which we have before spoken, as a yellow, oily, or rather glairy secretion, which performs the indispensable office of facilitating the play of the tendons over the joints and certain given points of the bones. This fluid, which is deposited in a containing sac, the lining (serous) membrane of which forms the secreting organ, is of an excessively sensitive nature, and while it lines the inner face of the ligaments, both capsular and fascicular, is attached only upon the edges of the bones without extending upon their length or between the layers of cartilage which lie between the bones and their articular surfaces.

Our object in thus partially and concisely reviewing the structure and condition of the essential organs of locomotion has been rather to outline a sketch which may serve as a reference chart of the general features of the subject, than to offer a minute description of the parts referred to. Other points of interest will receive due attention as we proceed with the illustration of our subject and examine the matters which it most concerns us to bring under consideration. The foundation of facts which we have thus far prepared will be found sufficiently broad, we trust, to include whatever may be necessary to insure a ready comprehension of the essential matters which are to follow, as our review is carried forward to completion. What we have said touching

these elementary truths will probably be sufficient to facilitate a clear understanding of the requirements essential to the perfection and regularity which characterize the normal performance of the various movements which result in the accomplishment of the action of locomotion. So long as the bones, the muscles and their tendons, the joints with their cartilages, their ligaments and their synovial structure; the nerves and the controlling influences which they exercise over all, with the blood vessels which distribute to every part, however minute, the vitalizing fluid which sustains the whole fabric in being and activity—so long as these various constituents and adjuncts of animal life preserve their normal exemption from disease, traumatism and pathological change, the function of locomotion will continue to be performed with perfection and efficiency.

But on the other hand, let any element of disease become implanted in one or several of the parts destined for combined action, any change or irregularity of form, dimensions, location or action occur in any portion of the apparatus—any obstruction or misdirection of vital power take place, any interference with the order of the phenomena of normal nature, any loss of harmony and lack of balance be betrayed, and we have in the result the condition of *lameness*.

DEFINITION OF LAMENESS.

Physiology.—Comprehensively and universally considered, then, the term *lameness* signifies any irregularity or derangement of the function of locomotion irrespective of the cause which produced it or the degree of its manifestation. However slightly or severely it may be exhibited, it is all the same. The nicest observation may be demanded for its detection, and it may need the most thoroughly trained powers of discernment to identify and locate it, as in cases where the animal is said to be *fainting*, *tender*, or to *go sore*. Or the patient may be so far affected as to refuse utterly to use an injured leg, and under compulsory motion keep it raised from the ground, and prefer to travel on three legs rather than to bear any portion of his weight upon the afflicted member. In these two extremes, and in all the intermediate degrees, the patient is simply *lame*—pathognomonic minutiæ being considered and settled in a place of their own.

These last two classifications of the condition of disabled function, of simple lameness and lameness on three legs, are very easy of detection, but the first or mere tenderness, or soreness, may be very difficult to identify, and at times very serious results have followed from the obscurity which has enveloped the early stages of the malady. For it may easily occur that in the absence of the treatment which an early correct diagnosis would have indicated, an insidious ailment may so take advantage of the lapse of time as to root itself too deeply into the economy to be subverted, and become transformed into a disabling chronic case, or possibly one that is incurable and fatal. Hence the im-

policy of depreciating early symtoms because they are unaccompanied by distinct and pronounced characteristics, and from a lack of threatening appearances inferring the absence of danger. The possibilities of an ambush can never be safely ignored. An extra caution costs nothing, even if wasted. The fulfillment of the first duty of a practitioner, when introduced to a case, is not always an easy task, though it is too frequently expected that the diagnosis or "what is the matter" verdict will be reached by the quickest and surest kind of an "instantaneous process," and a sure prognosis, or "how will it end" guessed at instanter.

Usually the discovery that the animal is becoming lame is comparatively an easy matter to a careful observer. Such a person will readily note the changes of movement which will have taken place in the animal he has been accustomed to drive or ride, unless they are indeed slight and limited to the last degree. But what is not always easy is the detection, after discovering the fact of an existing irregularity, of the locality of its point of origin, and whether its seat be in the near or off leg, or in the fore or the hind part of the body. These are questions too often wrongly answered, notwithstanding the fact that with a little careful scrutiny the point may be easily settled. The error, which is too often committed, of pronouncing the leg upon which the animal travels soundly as the seat of the lameness, is the result of a misinterpertation of the physiology of locomotion in the crippled animal. Much depends upon the gait with which the animal moves while under examination. The act of walking is unfavorable for accurate observation, though, if the animal walks on three legs, the decision is easy to reach. The action of galloping will often, by the rapidity of the muscular movements and their quick succession, interfere with a nice study of their rhythm, and it is only under some peculiar circumstances that the examination can be safely conducted while the animal is moving with that gait. It is while the animal is trotting that the investigation is made with the best chances of an intelligent decision, and it is while moving with that gait, therefore, that the points should be looked for which must form the elements of the diagnosis.

Our first consideration should be the physiology of normal or healthy locomotion, that from thence we may the more easily reach our conclusions touching that which is abnormal, otherwise lameness, and by this process we ought to succeed in obtaining a clew to the solution of the first problem, to wit: *in which leg is the seat of the lameness?*

A word of definition is here necessary, in order to render that which follows more easily intelligible. In veterinary nomenclature each two of the legs, as referred to in pairs, are denominated a biped. The four points occupied by the feet of the animal while standing at rest, forming a square, the two fore legs are known as the *anterior* biped; the two hinder, the *posterior;* the two on one side, the *lateral;* and one of either the front or hind biped with the opposite leg of the hind or front biped will form the *diagonal biped.*

Considering, as it is proper to do, that in a condition of health each separate biped and each individual leg is required to perform an equal and uniform function and to carry an even or equal portion of the weight of the body, it will be readily appreciated that the result of this equal distribution will be a regular, evenly balanced, and smooth displacement of the body thus supported by the four legs, and that therefore, according to the rapidity of the motion in different gaits, each single leg will be required at certain successive moments to bear the weight which had rested upon its congener while it was itself in the air, in the act of moving; or, again, two different legs of a biped may be called upon to bear the weight of the two legs of the opposite biped while also in the air in the act of moving.

To simplify the matter by an illustration, the weight of an animal may be placed at 1,000, of which each leg, in a normal and healthy condition, supports while at rest 250. When one of the fore legs is in action, or in the air, and carrying no weight, its 250 share of the weight will be thrown upon its congener or partner to sustain. If the two legs of a biped are both in action and raised from the ground, their congeners still resting in inaction, will carry the total weight of the other two, or 500. And as the succession of movements continues, and the change from one leg to another or from one biped to another, as may be required by the gait, proceeds, there will result a smooth, even, and equal balancing of active movements, shifting the weight from one leg or one biped to another, with symmetrical precision, and we shall be presented with an interesting example of the play of vital mechanics in a healthy organization.

Much may be learned from the accurate study of the action of a single leg. Normally, its movements will be without variation or failure. When at rest it will easily sustain the weight assigned to it, without showing hesitancy or betraying pain, and when it is raised from the ground in order to transfer the weight to its mate, it will perform the act in such a manner that when it is again placed upon the ground to rest it will be with a firm tread, indicative of its ability to receive again the burden to be thrown back upon it. In planting it upon the ground or raising it up again for the forward movement while in action, and again replanting it upon the earth, each movement will be the same for each leg and for each biped, whether the act be that of walking or trotting, or even of galloping. In short, the regular play of every part of the apparatus will testify to the existence of that condition of orderly soundness and efficient activity which is eloquently suggestive of the condition of vital integrity, which is simply but comprehensively expressed by the terms *health and soundness.*

But let some change, though slight and obscure, occur among the elements of the case, some invisible agency of evil intrude among the harmonizing processes going forward; any disorder occur in the rela-

tions of coöperating parts; anything appear to neutralize the efficiency of vitalizing forces; any disability of a limb to accept and to throw back upon its mate the portion of the weight which belongs to it to sustain, whether as the effect of traumatic accidents or otherwise; in short, whatever tends to defeat the purpose of nature in organizing the locomotive apparatus may be looked upon as a cause of *lameness.* And it is not the least of the facts which it is important to remember that it is not sufficient to look for the manifestation of an existing discordance in the action of the affected limb alone, but that it is shared by the sound one, and must be searched for in that as well as the halting member, if the hazard of an error is to be avoided. The mode of action of the leg, which is the seat of the lameness, will vary greatly from that which it exhibited when in a healthy condition, and the sound leg will also offer important modifications in the same three particulars before alluded to, to wit, that of resting on the ground, that of its elevation and forward motion, and that of striking the ground again when the full action of stepping is accomplished. Inability in the lame leg to sustain weight will imply excessive exertion by the sound one, and lack of facility or disposition to rest the lame member on the ground will necessitate a longer continuance of that action on the sound side. Changes in the act of elevating the leg, or of carrying it forward, in both, will present, however, entirely opposite conditions between the two. The lame member will be elevated rapidly, moved carefully forward, and returned to the ground with caution and hesitancy, and the contact with the earth will be effected as lightly as possible, while the sound limb will rest longer on the ground, move boldly and rapidly forward, and strike the ground promptly and forcibly. All this is due to the fact that the sound member carries more than its normal, healthy share of the weight of the body, a share which may be in excess from 1 to 250, and thus bring its burden to a figure varying from 251 to 500, all depending upon the degree of the existing lameness, whether it is simply a slight tenderness or soreness, or whether the trouble has reached a stage which compels the patient to the awkwardness of traveling on three legs.

That all this is not mere theory, but rests on a foundation of fact may be established by observing the manifestations attending a single alteration in the balancing of the body. In health, the support and equilibrium of that mass of the body which is borne by the fore legs is equalized, and passes by regular alternations from the right to the left side, and *vice versa.* But if the left leg becoming disabled, relieves itself by leaning, as it were, on the right, the latter becomes, consequently, practically heavier, and the mass of the body will incline or settle upon that side. Lameness of the left side, therefore, means dropping or settling on the right, and *vice versa.* We emphasize this statement and insist upon it, the more from the frequency of the instances

of error which have come under our notice, in which parties have insisted upon their view that the leg which is the seat of the lameness is that upon which he drops, and which the animal is usually supposed to favor.

HOW TO DETECT THE SEAT OF LAMENESS.

Properly appreciating the remarks which have preceded, and fully comprehending the *modus operandi* and the true pathology of lameness, but little remains to be done in order to reach an answer to the question as to which side of the animal the lameness is seated, except to examine the patient while in action. We have already stated our reasons for preferring the movement of trotting for this purpose. In conducting such an examination the animal should be unblanketed, and held by a plain halter in the hands of a man who knows how to manage his paces, and preference should be given to a hard road for the trial. He is to be examined from various positions—from before, from behind, and from each side. Watching him as he approaches, as he recedes, and as he passes by, the observer should carefully study that important action which we have spoken of as the *dropping of the body* upon one extremity or the other, and this can readily be detected by attending closely to the motions of the head and of the hip. The head drops on the same side on which the mass of the body will fall, dropping towards the right when the lameness is in the left fore-leg, and the hip dropping in posterior lameness, also on the sound leg, the reversal of the conditions, of course, producing reversed effects. In other words, when the animal in trotting exhibits signs of irregularity of action, or lameness, and this irregularity is accompanied by dropping or nodding the head, or depressing the hip on the right side of the body, at the time the feet of the right side strike the ground, the horse is lame on the left side. If the dropping and nodding are on the near side the lameness is on the off side.

But in a majority of cases the answer to the first question relating to the lameness of a horse is, after all, not a very difficult task. There are two other problems in the case more difficult of solution and which often require the exercise of a closer scrutiny, and draw upon all the resources of the experienced practitioner to settle satisfactorily. That a horse is lame in a given leg may be easily determined, but when it becomes necessary to pronounce upon the query as to what part, what region, what structure, is affected, the easy part of the task is over, and the more difficult and important, because more obscure portion of the investigation has commenced—except, of course, in cases of which the features are too distinctly evident to the senses to admit of error. It is true that by carefully noting the manner in which a lame leg is performing its functions, and closely scrutinizing the motions of the whole extremity, and especially of the various joints which enter into its structure; by minutely examining every part of the limb; by observing the outlines; by testing the change, if any, in temperature and the state

of the sensibility—all these investigations may guide the surgeon to a correct localization of the seat of trouble, but he must carefully refrain from the adoption of a hasty conclusion, and above all, assure himself that he has not failed to make the foot, of all the organs of the horse the most liable to injury and lesion, the subject of the most thorough and minute examination of all the parts which compose the suffering extremity.

The greater liability of the foot than of any other part of the extremities to injury from casualties, natural to its situation and use, should always suggest the beginning of an inquiry, especially in an obscure case of lameness at that point. Indeed the lameness may have an apparent location elsewhere, when that is the true seat of the trouble, and the surgeon who, while examining his lame patient, discovers a ringbone, and satisfying himself that he has encountered the cause of the disordered action suspends his investigation without subjecting the foot to a close scrutiny, may deeply regret his neglect and inadvertence at a later day, when regrets will avail nothing towards remedying the irreparable injury which has ensued upon his partial method of exploration. But, as in human pathological experience, there are instances when inscrutable diseases will deliver their fatal messages, while leaving no mark and making no sign by which they might be identified and classified, so it will happen that in the humbler animals the onset and progress of mysterious and unrecognizable ailments will at times baffle the best veterinarian skill, and leave our burden-bearing servants to succumb to the inevitable, and suffer and perish in unrelieved distress.

DISEASES OF BONES.

PERIOSTITIS—OSTITIS—EXOSTOSIS.

From the closeness and intimacy of the connection existing between the two principal elements of the bony structure while in health, it frequently becomes exceedingly difficult, when a state of disease has supervened, to discriminate accurately as to the part primarily affected, and to determine positively whether the periosteum or the body of the bone is originally implicated. Yet a knowledge of the fact is often of the first importance, in order to secure a favorable result from the treatment to be instituted. It is, however, quite evident that in a majority of instances the bony growths which so frequently appear on the surface of their structure, to which the general term of *exostosis* is applied, have had their origin in an inflammation of the periosteum, or enveloping membrane, and known as *periostitis*. However this may be we have as a frequent result, sometimes on the length of the bone, sometimes at the extremities, and sometimes involving the articulation itself, certain bony growths, or exostoses, known otherwise by the term *splint*, *ringbone* and *spavin*, all of which, in an important sense, may be finally referred to the periosteum as their nutrient source and

support, at least after their formation, if not for their incipient existence. It is certain that inflammation of the periosteum is frequently referable to wounds and bruises caused by external agencies, and it is also true that it may possibly result from the spreading inflammation of surrounding diseased tissues, but in any case the result is uniformly seen in the deposit of a bony growth, more or less diffuse, sometimes of irregular outline, and at others projecting distinctly from the surface from which it springs, as so commonly presented in the ringbone and the spavin. This condition of periostitis is often difficult to determine. The signs of inflammation are so obscure, the swelling of the parts so insignificant, any increase of heat so imperceptible, and the soreness so slight, that even the most acute observer may fail to locate the point of its existence, and it is often long after the discovery of the disease itself that its location is positively revealed by the visible presence of the exostosis. Yet the first question had been resolved, in discovering the fact of the lameness, while the second and third remained unanswered, and the identification of the affected limb and the point of origin of the trouble remained unknown until their palpable revelation to the senses. When, by careful scrutiny the ailment has been located, a resort to treatment must be had at once, in order to prevent, if possible, any further deposit of the calcareous structure and increase of the exostotic growth. With this view the application of water, either warm or cold, rendered astringent by the addition of alum or sugar of lead, will be beneficial. The tendency to the formation of the bony growth, and the increase of its development after its actual formation, may often be checked by the application of a severe blister of Spanish fly. The failure of these means and the establishment of the diseased process in the form of chronic periostitis causes various changes in the bone covered by the disordered membrane, and the result may be softening, degeneration, or necrosis, but more usually it is followed by the formation of the bony growths referred to, on the cannon bone, the coronet, the hock, etc.

SPLINTS.

We first turn our attention to the splint, as certain bony enlargements which are developed on the cannon bone, between the knee or the hock and the fetlock joint, are called. They are found on the inside of the leg, from the knee, near to which they are to be found, downward to about the lower third of the principal cannon bone. They are of various dimensions, and are readily perceptible both to the eye and to the touch. They vary considerably in size, ranging from that of a large nut downward to very small proportions. In searching for them they may be readily detected by the hand if they have attained sufficient development in their usual situation, but must be distinguished from a small bony enlargement which may be felt at the lower third of the cannon bone, and is not a splint nor a pathological formation of any kind, but merely the normal development of the small cannon bone.

We have said that splints are to be found on the inside of the leg. This is true as a general statement, but it is not invariably so, and they occasionally appear on the outside. It is also true that they appear most commonly on the fore legs, but this is not exclusively the case, and they may at times be found on both the inside and outside of the hind legs. Usually a splint forms only a true exostosis, or a single bony growth, with a somewhat diffuse base, but neither is this invariably the case. In some instances they assume more important dimensions, and pass from the inside to the outside of the bone, on its posterior face, between that and the suspensory ligament. This form is termed the *pegged splint*, and constitutes a serious and permanent deformity, in consequence of its interference with the play of the fibrous cord which passes behind it, becoming thus a source of continual irritation and consequently of permanent lameness.

A splint may thus frequently become a cause of lameness though not necessarily in every instance; but it is a lameness possessing features peculiar to itself. It is not always continuous, but at times assumes an intermittent character, and is more marked when the animal is warm than when he is cool. If the lameness is near the knee-joint, it is very apt to become aggravated when the animal is put to work, and the gait acquires then a peculiar character, arising from the manner in which the limb is carried outward from the knees downwards, which is done by a kind of abduction of the lower part of the leg. Other symptoms, however, than the lameness and the presence of the splint, which is its cause, may be looked for in the same connection as those which have been mentioned as pertaining to certain evidences of periostitis, in the increase of the temperature of the part, with swelling and probably pain on pressure. This last symptom is of no little importance, since its presence or absence has in many cases formed the determining point in deciding a question of difficult diagnosis.

A splint being one of the results of periostitis, and the latter one of the effects of external hurts, it naturally follows that the parts which are most exposed to blows and collisions will be those on which the splint will most commonly be found, and it may not be improper, therefore, to refer to hurts from without as among the common causes of the lesion. But other causes may also be productive of the evil, and among these may be mentioned the overstraining of an immature organism by the imposition of excessive labor upon a young animal at a too early period of his life. The bones which enter into the formation of the cannon are three in number, one large and two smaller, which, during the youth of the animal, are more or less articulated, with a limited amount of mobility, but which become in maturity firmly joined by a rigid union and ossification of their inter-articular surface. If the immature animal be compelled, then, to perform exacting tasks beyond his strength the inevitable result will follow in the muscular straining, and perhaps tearing asunder of the fibers which unite the bones at their

points of juncture, and it is difficult to understand how the natural consequences of such a local irritation developing in inflammation or periostitis can be avoided. If the result were deliberately and intelligently designed it could hardly be more effectually accomplished.

The splint is an object of the commonest occurrence, so common, indeed, that in large cities a horse which can not exhibit one or more specimens upon some portion of his extremities is one of the rarest of spectacles. Though it is in some instances a cause of lameness and its discovery and cure are sometimes beyond the ability of the shrewdest and most experienced veterinarian, yet as a source of vital danger to the general equine organization, or even of functional disturbance, or of practical inconvenience, aside from the rare exceptional cases which exist as mere samples of possibility, it can not be considered to belong to the category of serious lesions. The worst stigma that attaches to it is that in general estimation it is ranked among eyesores, and continues indefinitely to be that and nothing less or better. The inflammation in which they originated, acute at first, either subsides or assumes the chronic form, and the bony growth becomes a permanence, more or less established, it is true, but doing no positive harm, and not hindering the animal from continuing his daily routine of labor. All this, however, requires a proviso against the occurrence of a subsequent acute attack, when, as with other exostoses, a fresh access of acute symptoms may be followed by a new pathological activity which shall again develop as a natural result a reappearance of the lameness.

It is of course the consideration of the comparative harmlessness of splints that suggests and justifies the policy of non-interference, except as they become a positive cause of lameness. And a more positive argument for such non-interference consists in the fact that any active and irritating treatment may so excite the parts as to bring about a renewed pathological activity, which may result in a reduplication of the phenomena, with a second edition if not a second and enlarged volume of the whole story. For our part our faith is firm in the impolicy of interference, and this faith is founded on an experience of many years, during which our practice has been that of abstention.

Of course there will be exceptional conditions which will at times indicate a different course. These will become evident when the occasions present themselves, and extraordinary forms and effects of inflammation and growth in the tumors offer special indications. But our conviction remains unshaken that surgical treatment of the operative kind is usually useless, if not dangerous. We have little faith in the method of extirpation except under very special conditions, among which that of diminutive size has been named, which seems in itself to constitute a sufficient negative argument. But even in such a case a resort to the knife or the gouge could scarcely find a justification, since no operative procedure is ever without a degree of hazard, to say

nothing of the considerations which are always forcibly negative in any question of the infliction of pain and the unnecessary use of the knife.

If an acute periostitis of the cannon bone has been readily discovered, the treatment we have already suggested for that ailment is at once indicated, and the astringent lotions may be relied upon to bring about beneficial results. Sometimes, however, preference may be given to a lotion possessing a somewhat different quality, the alterative consisting of tincture of iodine applied to the inflamed spot several times daily. If the lameness persists under this mild course of treatment it must of course be attacked by other methods, and we must resort to the cantharidal ointment or Spanish-fly blister, as we have before recommended. Besides this, and producing an analogous effect, the compounds of biniodide of mercury are favored by some. It is prepared in the form of an ointment, consisting of 1 dram of the biniodide to 1 ounce of either lard or vaseline. It forms an excellent blistering and alterative application, and is of special advantage in newly formed or recently discovered exostosis.

It remains a pertinent query, however, and one which seems to be easily answered, whether a tumor so diminutive in size that it can only be detected by diligent search, and which is neither a disfigurement nor an obstruction to the motion of the limb, need receive any recognition whatever. Other modes of treatment for splints are recommended and practiced which belong strictly to the domain of operative veterinary surgery. Among these are to be reckoned actual cauterization, or the application of the fire-iron and the operation of periosteotomy. These are frequently indicated in the treatment of splints which have resisted milder means.

The mode of the development of their growth; their intimacy, greater or less, with both the large and the small cannon bones; the possibility of their extending to the back of these bones under the suspensory ligament; the dangerous complications which may follow the rough handling of the parts; with also a possibility, and indeed a probability, of their return after removal, these are the considerations which have influenced our judgment in discarding from our practice and our approval the method of removal by the saw or the chisel, as recommended by certain European veterinarians.

RINGBONES.

This peculia. cerm forms the designation of the exostosis which is found on the coronet, in the digital, and also in the phalangeal region, probably because it extends quite around the coronet, which it encircles in the manner of a ring, or perhaps because it often forms upon the back of that bone a regular osseous circlet, through which the back tendons obtain a passage. The dimensions which may be attained by these tumors and the places where they are usually developed have

caused their subdivision and classification into three varieties, with the designations of *high*, *middle*, and *low*, though much can not be said as to the importance of such distinction. It is true that the ringbone or phalangeal exostosis may be found at various points on the coronet, in one case forming a large bunch on the upper part and quite close to the fetlock joint; then appearing on the very lower portion around the upper border of the foot; seen again on the extreme front of the coronet; or perhaps discovered on the very back of it. The shape in which they commonly appear is favorable to their easy discovery, their form when near the fetlock usually varying too much from the natural outlines of the part when compared with those of the opposite side to admit of error in the matter.

A ringbone when in front of the coronet, even when not very largely developed, assumes the form of a diffused convex swelling. If situated on the lower part, it will form a thick ring, encircling the upper portion of the foot; when found on the posterior part, a small, sharp osseous growth somewhat projecting, sometimes on the inside and sometimes on the outside of the coronet, may comprise the entire manifestation.

As with splints, ringbones may result from severe labor in early life, before the process of ossification has been fully perfected; or they may be referred to bruises, blows, sprains, or other violence; or injuries of tendons, ligaments, or joints may be among the accountable accidents. It is certain that they may commonly be traced to diseases and traumatic lesions of the foot, and their appearance may be reasonably anticipated among the sequelæ of an abscess of the coronet; or the cause may be a severe contusion resulting from calking, or a deep-punctured wound from picking up a nail or stepping upon any hard object of sufficiently irregular form to penetrate the sole.

Moreover, a ringbone may claim to possess the character of a legacy—it may originate in heredity. This is a fact of no little importance in its relation to questions connected with the extensive interests of the stock breeder and purchaser. To regard a liability to transmit constitutional idiosyncrasies by common propagation as a disease or a diathesis would be obviously unphilosophical; but to recognize the fact, in view of existing evidences, in connection with the affection we are considering, is but to render its due to the claims of honest conviction and such, a conviction we do not hesitate to own. That it is an active tendency in respect to diseases generally it would be absurd to claim. But we do claim that a disposition to contract this particular form of lesion may be transmitted from parent to offspring, though in most cases only with sufficient vigor to impress a predisposition on the part of the latter. Yet in a smaller proportion of cases it may, in point of fact, constitute a force sufficient to act as a secondary cause of developed disease, which may in due time become a visible ringbone.

The importance of this point when considered in reference to the policy which should be observed in the selection of breeding stock, is

obvious, and as the whole matter is within the control of the owners and breeders it will be their own fault if the unchecked transmission of ringbones from one equine generation to another shall be allowed to continue. It is our belief that among the diseases which are known for their tendency to perpetuate and repeat themselves by individual succession, those of the bony structures stand first, and the inference from such a fact which would exclude every animal of doubtful soundness in its osseous apparatus from the stud list and the brood farm is too plain for argument.

Periostitis of the phalanges is an ailment requiring careful exploration and minute inspection for its discovery and is quite likely to result in a ringbone of which lameness is the effect. The mode of its manifestation varies according to the state of development of the diseased growth as affected by the circumstances of its location and dimensions. It is commonly of the kind which, in consequence of its intermittent character, is termed *lameness when cool*, having the peculiarity of exhibiting itself when the animal starts from the stable and of diminishing if not entirely disappearing after some distance of travel to return to its original degree, if not indeed a severer one when he has again cooled off in his stable. The size of the ringbone does not indicate the degree to which it cripples the patient, but the position may, especially when it interferes with the free movement of the tendons which pass behind and in front of the coronet. While a large ringbone will often interfere but little with the motion of the limb, a smaller growth if situated under the tendon, may become the cause of considerable and continued pain.

A ringbone is doubtless a worse evil than a splint. Its growth, its location, its tendency to increased development, its exposure to the influence of causes of renewed danger, all tend to impart an unfavorable cast to the prognosis of a case and to emphasize the importance and the value of an early discovery of its presence and possible growth. Even when the discovery has been accomplished it is often the case that the truth has come to light too late for effectual treatment. Months may have elapsed after the first manifestation of the lameness before a discovery has been made of the lesion from which it has originated, and there is no recall for the lapsed time. And by the uncompromising seriousness of the discouraging prognosis must the energy and severity of the treatment and the promptness of its administration be measured. The periostitis has been overlooked; any chance that might have existed for preventing its advance to the chronic stage has been lost; the osseous exudation is established; the ringbone is a fixed fact, and the indications are urgent and pressing. These include severe blistering once or twice repeated; the application of the red iodide of mercury, and if these fail, firing with the hot iron, and as a last resort, neurotomy, high or low as indicated by the seat of the lesion.

SIDE BONES.

On each side of the bone of the foot—the coffin-bone—there are normally two supplementary organs which are called the *cartilages of the foot.* They are soft, and though in a degree elastic, yet somewhat resisting, and are implanted on the lateral wing of the coffin-bone. Evidently their office is to assist in the elastic expansion and contraction of the posterior part of the foot, and their healthy and normal action doubtless contributes in an important degree to the perfect performance of the functions of that part of the leg. These organs are, however, liable to undergo a process of disease which results in an entire change in their properties, if not in their shape, by which they acquire a character of hardness resulting from the deposit of earthy substance in the intimate structure of the cartilage, and it is this change, when its consummation has been affected, that brings to our cognizance the diseased growth which has received the designation of *side-bones.* They are situated on one or both sides of the leg, bulging above the superior border of the foot in the form of two hard bodies composed of ossified cartilage, irregularly square in shape and unyielding under the pressure of the fingers.

The side-bone may be a termination of a low inflammatory condition, or of an acute attack as well, or may be caused by sprains, bruises, or blows; or they may have their rise in certain diseases affecting the foot proper, as corns, quarter cracks, or quittor. The deposit of calcareous matter in the cartilage is not always uniform, the base of that organ near its line of union with the coffin-bone being in some cases its limit, while at other times it is diffused throughout its substance, the size and prominence of the tumors varying much in consequence. It would naturally be inferred that the amount of interference with the proper functions of foot which must result from such a pathological change would be proportioned to the size of the tumor, and that as the dimensions increased, the resulting lameness would be the greater in degree. This, however, is not the fact. A small tumor, while in a condition of acute inflammation during the formative stage, may cripple a patient more severely than a much larger one in a later stage of the disease. In any case the lameness is never wanting, and with its intermittent character may usually be detected when the animal is cooled off after labor or exercise. The class of animals in which this feature of the disease is most frequently witnessed is that of the heavy draft horse, and others similarly employed. There is a wide margin of difference in respect to the degrees of severity which may characterize different cases of side-bone. While one may be so slight as to cause no inconvenience, another may develop elements of danger which may involve the necessity of severe surgical interference.

The curative treatment should be similar to the prophylactic, and such means should be used as would tend to prevent the deposit of bony matters by checking the acute inflammation which causes it.

The means recommended are the free use of the cold bath; frequent soaking of the feet, and at a later period treatment with iodine, either by painting the surface with the tincture several times daily, or by applying an ointment made by mixing 1 dram of the crystals with 2 ounces of vaseline, rubbed in once a day for several days. If this proves to be ineffective, a Spanish fly blister, to which a few grains of biniodide of mercury have been added, will, in a majority of cases, effect the desired result and remove the lameness. If, finally, this treatment is resisted, the case must be relegated to the surgeon for the operation of neurotomy, or the application of the fire-iron, freely and deeply.

SPAVIN.

This affection, popularly termed *bone spavin*, is an exostosis of the hock joint. The general impression is that in a spavined hock the bony growth should be seated on the anterior and internal part of the joint, and this is partially correct, as such a growth will constitute a spavin in the most correct sense of the term. But an enlargement may appear on the upper part of the hock also, or possibly a little below the inner side of the lower extremity of the shank bone, forming what is known as a *high spavin*; or, again, the growth may form just on the outside of the hock and become an *outside* or *external spavin*. And, finally, the entire under surface may become the seat of the osseous deposit, and involve the internal face of all the bones of the hock, and this again is a *bone spavin*. There would seem, then, to be but little difficulty in comprehending the nature of a bone spavin, and there would be none but for the fact that there are similar affections which might confuse a diagnosis if not very carefully and intelligently made.

But the hock may be spavined, while to all outward observation it still retains its perfect form. With no enlargement tangible to sight or touch the animal may be disabled by an *occult spavin*, an anchylosis in fact, which has resulted from a union of several of the bones of the joint, and it is only those who are able to realize the importance of its action to the perfect fulfillment of the function of propulsion by the hind leg, who can comprehend the gravity of the only prognosis which can be justified by the facts of the case—a prognosis which is essentially a sentence of serious import in respect to the future usefulness and value of the animal. For no diseases, if we except those acute inflammatory attacks upon vital organs to which the patient succumbs at once, are more destructive to the usefulness and value of a horse than a confirmed spavin. Serious in its inception, serious in its progress, it is an ailment which, when once established, becomes a fixed condition which there are no known means of dislodging. The periostitis, of which it is nearly always a termination, is usually the effect of a traumatic cause operating upon the complicated structure of the hock, such as a sprain which has torn a ligamentous insertion and lacerated some of its fibers; or a violent effort in jumping, galloping, or

trotting, to which the victim has been compelled by the torture of whip and spur while in use as a gambling implement by a sporting owner, under the pretext of "improving his breed;" or the extra exertion of starting an inordinately heavy load; or an effort to recover his balance from a misstep; or slipping upon an icy surface; or sliding with worn shoes upon a bad pavement, and other kindred causes. And we can repeat here what we have before said concerning bones, in respect to heredity as a cause. As to this, our own experience is an authority—we do know of equine families in which this condition has been transmitted from generation to generation, and animals otherwise of excellent comformation rendered valueless by the misfortune of a congenital spavin.

The evil is one of the most serious character for other reasons, among which may be specified the slowness of their development and the insidiousness of their growth. Certain indefinite phenomena and alarming changes and incidents furnish usually the only portents of approaching trouble. Among these signs may be mentioned a peculiar posture assumed by the patient while at rest, and becoming at length so habitual that it can not fail to suggest the action of some hidden cause, tending to some undeterminable result. The posture is due to the action of the adductor muscles, the lower part of the leg being carried inward, and the heel of the shoe resting ou the toe of the opposite foot. Then an unwillingness may be noticed in the animal to move from one side of the stall to the other. When driven he will travel, but stiffly, and with a sort of sideloug gait between the shafts, and after finishing his task and resting again in his stall, will pose with the toe pointing forward, the heel raised, and the hock flexed. Some little heat and a considerable amount of inflammation soon appears. The slight lameness which appears when backing out of the stall ceases to be noticeable after a short distance of travel.

A minute examination of the hock will then begin to reveal the existence of the lesion, in a bony enlargement which may be detected just at the junction of the hock and the cannon bone, on the inside and a little in front, and tangible both to sight and touch. This enlargement or *bone spavin* grows rapidly and persistently and soon acquires dimensions which render it impossible to doubt any longer its existence or its nature. Once established, its development continues under conditions of progress similar to those to which we have before alluded, in speaking of other like affections. The argument obtained by some that because these bony deposits are frequently found on both hocks they are not spavins, is fallacious. If they are discovered on both hocks, it proves merely that they are not confined to a single joint.

The characteristic lameness of bone spavin, as it affects the motion of of the hock joint, presents two aspects. In one class of cases it is most pronounced when the horse is cool, in the other when he is at work. The first is characterized by the fact that when the animal travels the

toe first touches the ground, and the heel descends more slowly, the motion of flexion at the hock taking place stiffly, and accompanied by a dropping of the hip on the opposite side. In the other case the peculiarity is that the lameness increases as the horse travels; that when he stops he seeks to favor the lame leg, and when he resumes his work soon after he steps much on his toe, as in the first variety.

As with sidebones, though for a somewhat different reason, the dimensions of the spavin and the degree of the lameness do not seem to bear any determinate relation, the most pronounced symptoms at times accompanying a very diminutive growth. But the distinction between the two varieties of *cool* and *warm* may easily be determined by remembering the fact that in a majority of cases the first, or cool, is due to a simple exostosis, while the second is generally connected with disease of the articulation, such as ulceration of the articular surface—a condition which, as we proceed further, will meet our attention when we reach the subject of springhalt.

Having thus fully considered the history of bone spavin we are prepared to give due weight to the reasons which exist for the adverse prognosis which we must usually feel compelled to pronounce when encountering it in practice, as well as to realize the value of an early discovery of the symptoms which denote its invasion of the organism. It is but seldom, however, that the necessary advantage of this early knowledge can be secured, and when the true nature of the trouble has become apparent it is usually too late to resort to the remedial measures which, if duly forewarned, a skillful practitioner might have employed. We are fully persuaded that but for the loss of the time wasted in the treatment of purely imaginary ailments very many cases of bone spavin might be arrested in their incipiency and their victims preserved for years of comfort for themselves and valuable labor to their owners.

To consider a hypothetical case: An early discovery of lameness has been made; that is, the existence of an acute inflammation—of periostitis—has been detected. The increased temperature of the parts has been observed, with the stiffened gait and the characteristic pose of the limb, and the question is proposed for solution, "What is to be done?" Even with only these comparatively doubtful symptoms—doubtful with the non-expert—we should direct our treatment to the hock in preference to any other joint, since of all the joints of the hind leg it is this which is most liable to be attacked, a natural result from its peculiarities of structure and function. And in answer to the query, "What is the first indication?" we should answer *rest*—emphatically, and as an essential condition, *rest*. Whether only threatened, suspected, or positively diseased, the animal must be wholly released from labor, and it must be no partial or temporary quiet of a few days. In all stages and conditions of the disease, whether the spavin is nothing more than a simple exostosis, or whether accompanied by the complication of arthritis, there must be a total suspension of effort until the danger is

support, at least after their formation, if not for their incipient existence. It is certain that inflammation of the periosteum is frequently referable to wounds and bruises caused by external agencies, and it is also true that it may possibly result from the spreading inflammation of surrounding diseased tissues, but in any case the result is uniformly seen in the deposit of a bony growth, more or less diffuse, sometimes of irregular outline, and at others projecting distinctly from the surface from which it springs, as so commonly presented in the ringbone and the spavin. This condition of periostitis is often difficult to determine. The signs of inflammation are so obscure, the swelling of the parts so insignificant, any increase of heat so imperceptible, and the soreness so slight, that even the most acute observer may fail to locate the point of its existence, and it is often long after the discovery of the disease itself that its location is positively revealed by the visible presence of the exostosis. Yet the first question had been resolved, in discovering the fact of the lameness, while the second and third remained unanswered, and the identification of the affected limb and the point of origin of the trouble remained unknown until their palpable revelation to the senses. When, by careful scrutiny the ailment has been located, a resort to treatment must be had at once, in order to prevent, if possible, any further deposit of the calcareous structure and increase of the exostotic growth. With this view the application of water, either warm or cold, rendered astringent by the addition of alum or sugar of lead, will be beneficial. The tendency to the formation of the bony growth, and the increase of its development after its actual formation, may often be checked by the application of a severe blister of Spanish fly. The failure of these means and the establishment of the diseased process in the form of chronic periostitis causes various changes in the bone covered by the disordered membrane, and the result may be softening, degeneration, or necrosis, but more usually it is followed by the formation of the bony growths referred to, on the cannon bone, the coronet, the hock, etc.

SPLINTS.

We first turn our attention to the splint, as certain bony enlargements which are developed on the cannon bone, between the knee or the hock and the fetlock joint, are called. They are found on the inside of the leg, from the knee, near to which they are to be found, downward to about the lower third of the principal cannon bone. They are of various dimensions, and are readily perceptible both to the eye and to the touch. They vary considerably in size, ranging from that of a large nut downward to very small proportions. In searching for them they may be readily detected by the hand if they have attained sufficient development in their usual situation, but must be distinguished from a small bony enlargement which may be felt at the lower third of the cannon bone, and is not a splint nor a pathological formation of any kind, but merely the normal development of the small cannon bone.

We have said that splints are to be found on the inside of the leg. This is true as a general statement, but it is not invariably so, and they occasionally appear on the outside. It is also true that they appear most commonly on the fore legs, but this is not exclusively the case, and they may at times be found on both the inside and outside of the hind legs. Usually a splint forms only a true exostosis, or a single bony growth, with a somewhat diffuse base, but neither is this invariably the case. In some instances they assume more important dimensions, and pass from the inside to the outside of the bone, on its posterior face, between that and the suspensory ligament. This form is termed the *pegged splint*, and constitutes a serious and permanent deformity, in consequence of its interference with the play of the fibrous cord which passes behind it, becoming thus a source of continual irritation and consequently of permanent lameness.

A splint may thus frequently become a cause of lameness though not necessarily in every instance; but it is a lameness possessing features peculiar to itself. It is not always continuous, but at times assumes an intermittent character, and is more marked when the animal is warm than when he is cool. If the lameness is near the knee-joint, it is very apt to become aggravated when the animal is put to work, and the gait acquires then a peculiar character, arising from the manner in which the limb is carried outward from the knees downwards, which is done by a kind of abduction of the lower part of the leg. Other symptoms, however, than the lameness and the presence of the splint, which is its cause, may be looked for in the same connection as those which have been mentioned as pertaining to certain evidences of periostitis, in the increase of the temperature of the part, with swelling and probably pain on pressure. This last symptom is of no little importance, since its presence or absence has in many cases formed the determining point in deciding a question of difficult diagnosis.

A splint being one of the results of periostitis, and the latter one of the effects of external hurts, it naturally follows that the parts which are most exposed to blows and collisions will be those on which the splint will most commonly be found, and it may not be improper, therefore, to refer to hurts from without as among the common causes of the lesion. But other causes may also be productive of the evil, and among these may be mentioned the overstraining of an immature organism by the imposition of excessive labor upon a young animal at a too early period of his life. The bones which enter into the formation of the cannon are three in number, one large and two smaller, which, during the youth of the animal, are more or less articulated, with a limited amount of mobility, but which become in maturity firmly joined by a rigid union and ossification of their inter-articular surface. If the immature animal be compelled, then, to perform exacting tasks beyond his strength the inevitable result will follow in the muscular straining, and perhaps tearing asunder of the fibers which unite the bones at their

extends within a joint or otherwise, and once more, *intra-periosteal*, when the periosteum remain intact. And, finally, there is no absolute limit to the use of descriptive terminology in the case.

The condition of displacement is largely influential in determining the question of treatment, and as affecting the final result of a case of fracture. This, however, is dependent upon its location or whether its seat be in one or more of the axes of the bone, in its length, its breadth, its thickness, or its circumference. An incomplete fracture may also be either simple or comminuted, the periosteum, in the latter case when it is intact, keeping the fragments together, the fracture in that case belonging to the intra-periosteal class. At times, also, there is only a simple fissure or split in the bone, making a condition of much difficulty of diagnosis.

Two varieties of originating cause may be recognized in cases of fracture. They are the *predisposing* and the *occasional*. As to the first, different species of animals differ in the degree of their liability. That of the dog is greater than that of the horse, and, in horses, the various questions of age, the mode of labor, the season of the year, the portion of the body most exposed, and the existence of ailments, local and general, are all to be taken into account.

Among horses, those employed in heavy draught work or that are driven over bad roads, are more exposed than light-draught or saddle horses, and animals of different ages are not equally liable. Dogs and young horses, with those which have become sufficiently aged for their bones to have acquired an enhanced degree of frangibility, are more liable than those which have not exceeded the time of their adult prime. The season of the year is undoubtedly, though in an incidental way, an important factor in the problem of the etiology of these accidents, for though they may be observed at all times, it is during the months when the slippery condition of the icy roads renders it difficult for both men and beasts to keep their feet that they occur most frequently. The long bones, those especially which belong to the extremities, are most frequently the seat of fractures, from the circumstance of their superficial position; their exposure to contact and collision, and the violent muscular efforts involved both in their constant rapid movement and their labor in the shafts or at the pole of heavy and heavily laden carriages.

The relation between sundry idiosyncrasies and diatheses and a liability to fractures is too constant and well established a pathological fact to need more than a passing reference. The history of rachitis, of melanosis, and of osteo-porosis, as related to an abnormal frangibility of the bones, is a part of our common medical knowledge. There are few persons who have not known of cases among their friends of frequent and almost spontaneous fractures, or at least of such as seem to be produced by the slightest and most inadequate violence, and there is no tangible reason for doubting an analogous condition in individuals of

the equine constitution. Among local predisposing affections mention must not be omitted of such bony diseases as caries, tuberculosis, and others of the same class.

Occasional or "efficient" causes of fracture are in most instances external traumatisms, as violent contacts, collisions, falls, etc., or sudden muscular contractions. These external accidents are various in their character, and are usually associated with quick muscular exertion. A violent, ineffectual effort to move too heavy a load; a semi-spasmodic bracing of the frame to avoid a fall or resist a pressure; a quick jump to escape a blow; stopping too suddenly after speeding; struggling to liberate a foot from a rail, perhaps to be thrown in the effort—all these are familiar and easy examples of accidents happening hourly, by which our equine servants become sufferers. We may add to these the fracture of the bones of the vertebra, occurring when casting a patient for the purpose of undergoing a surgical operation, quite as much the result of muscular contraction as of a preëxisting diseased condition of the bones. A fracture occurring under these circumstances may be called with propriety *indirect*, while one which has resulted from a blow or a fall differently caused is of the *direct* kind.

We now return to the first items in our classification of the varieties of lameness, for the purpose of bringing them in turn under an orderly review, and our first examination will include those which belong to the first category, or the *complete* kind. Irregularity in the performance of the functions of the apparatus to which the fractured bone belongs is a necessary consequence of the existing lesion, and this is *lameness*. If the broken bone belongs to one of the extremities, the impossibility of the performance of its natural function, in sustaining the weight of the body and contributing to the act of locomotion, is usually complete, though the degree of powerlessness will vary according to the kind of fracture and the bone which is injured. For example, a fracture of the cannon bone without displacement, or of one of the phalanges which are surrounded and sustained by a complex fibrous structure, is, in a certain degree, not incompatible with some amount of resting of the foot. But on the contrary, if the shank bone, or that of the forearm be the implicated member, it would be very difficult for the leg to exercise any agency whatever in the support of the body. And in a fracture of the lower jaw it would be obviously futile to expect it to contribute materially to the mastication of food.

A fracture seldom occurs which is not accompanied with a degree of deformity, greater or less, of the region or the leg affected. This is due to the exudation of the blood into the meshes of the surrounding tissues and to the displacement which occurs between the fragments of the bones, with subsequently the swelling which follows the inflammation of the surrounding tissues. The character of the deformity will mainly depend upon the manner in which the displacement occurs.

In a normal state of things the legs perform their movements with

the joints as their only centers or bases of action, with no participation of intermediate points, while with a fracture the flexibility and motion which will be observed at unnatural points are among the most strongly characteristic signs of the lesion. No one need be told that when the shaft of a limb is seen to bend midway between the joints, with the lower portion swinging freely, that the leg is broken. But there are still some conditions where the excessive mobility is not easy to detect with certainty. Such are the cases where the fracture exists in a short bone, near a movable joint, or in a bone of a region where several short and small bones are united in a group, or even in a long bone where its situation is such that the muscular covering prevents the visible manifestation of the symptom.

If the situation of a fracture precludes its discovery by means of this abnormal flexibility, other detective methods remain. And after all there is one decisive sign which, though it may not avail in every case, as it does not, is in cases where its testimony can be secured absolute and positive beyond question. This is *crepitation*, or the peculiar effect which is produced by the friction of the fractured surfaces one against another. Though discerned by the organs of hearing it can scarcely be called a sound, for the grating of the parts as the rubbing takes place is more felt than heard, but there is no mistaking its import in cases favorable for the application of the test. The conditions in which it is not available are those of incomplete fracture, in which the mobility of the parts is lacking, and those in which the whole array of phenomena are usually obscure. To obtain the benefit of this pathognomonic sign requires deliberate, careful, and gentle manipulation. Sometimes the slightest of movements will be sufficient for its development, after much rougher handling has failed to discover it. Perhaps the failure in the latter case is due to a sort of defensive spasmodic rigidity caused by the pain resulting from the rude interference.

More or less reactive fever is a usual accompaniment of a fracture, and an ecchymosis of the parts is but a natural occurrence, more easily discovered in animals possessing a light colored and delicate skin than in those of the opposite character.

There are difficulties in the way of the diagnosis of an incomplete fracture, even sometimes when there is a degree of impairment in the function of locomotion, with evidences of pain and swelling at the seat of lesion. There should then be a careful examination for evidences of a blow or other violence sufficient to account for the fracture, though very often a suspicion of its existence can only be converted into a certainty by a minute history of the patient if it can be obtained up to the moment of the occurrence of the injury. A diagnosis ought not to be hastily pronounced, and where good ground for suspicion exists it ought not to be rejected upon any evidence less than the best. Serious and fatal complications are too often recorded of the results following careless con-

clusions in similar cases, among which we may refer to one instance of a complete fracture manifesting itself in an animal during the act of rising up in his stall after a decision had been pronounced that he had no fracture at all.

Fractures are of course liable to complications, those especially, from the nature of the case, which are of a traumatic character, such as extensive lacerations, tearing of tissues, punctures, contusions, etc. But unless these are in communication with the fracture itself the indication is to treat them simply as independent lesions upon other parts of the body. A traumatic emphysema will at times cause trouble, and abscesses, more or less deep and diffused, may follow. In some cases small bony fragments from a comminuted fracture, becoming loose and acting as foreign bodies, may give rise to troublesome fistulous tracts. A frequent complication is hemorrhage, which often becomes of serious consequence. A fracture in close proximity to a joint may be accompanied by dangerous inflammations of important organs, and induce an attack of pneumonia, pleurisy, arthritis, etc., as well as luxations or dislocations, and the more so if situated near the chest. *Gangrene*, as a consequence of contusions or of hemorrhage or of an impediment to the circulation, caused by unskillfully applied apparatus, must not be overlooked among the occasional incidents; nor must *lockjaw*, which is not an uncommon occurrence. Even founder or laminitis has been met with as the result of forced and long continued immobility of the feet in the standing posture, as one of the involvements of unavoidably protracted treatment.

When a simple fracture has been properly treated and the broken ends of the bone have been securely held in coaptation one of two things will occur. Either—and this is the more common event—there will be a union of the two ends by a solid cicatrix, the callus, or the ends will continue separated or become only partially united by an intermediate fibrous structure. In the first instance the fracture is consolidated, or *united*, in the second there is a false articulation, or *pseudarthrosis*.

The time required for a firm union or true consolidation of a fracture will vary with the character of the bone affected, the age and constitution of the patient, and the general conditions of the case. The union will be perfected earlier in a young than in an adult animal, and sooner in the latter than in the aged, and a general healthy condition is of course, in every respect, an advantage.

The mode of cicatrization, or method of repair in lesions of the bones, has been a subject of much study among investigators in pathology, and has elicited various expressions of opinion from those high in authority. But the weight of evidence and preponderance of opinion are about settled in favor of the theory that the law of reparation is the same for both the hard and the soft tissues. In one case a simple exudation of material, with the proper organization of newly formed tissue, will

bring about a union by the first intention, and in another the work will be accompanied by suppuration, or the union by the second intention, a process so familiar in the repair of the soft structures by granulation.

Considering the process in its simplest form, in a case in which it advances without interruption or complication to a favorable result it may probably be correctly described in this wise:

On the occurrence of the injury an effusion of blood takes place between the ends of the bone. The coagulation of the fluid soon follows, and this, after a few days, undergoes absorption. There is then an excess of inflammation in the surrounding structure, which soon spreads to the bony tissue, when a true ostitis is established, and the compact tissue of the bone becomes the seat of a new vascular organization, and of a certain exudation of plastic lymph, appearing between the periosteum and the external surface of the bone, as well as on the inner side of the medullary cavity. After a few days the ends of the bone thus surrounded by this exudate become involved in it, and the lymph, becoming vascular, is soon transformed into cartilaginous, and in due time into bony tissue.

Thus the time required for the consolidation of the fractured segments is divisible into two distinct periods. In the first they are surrounded by an external bony ring, and the medullary cavity is closed by a bony plug or stopper, constituting the period of the *provisional callus*. This is followed by the period of *permanent callus*, during which the process is going forward of converting the cartilaginous into the osseous form.

The restorative process is sooner completed in the carnivorous than in the herbivorous tribes. In the former the temporary callus may attain sufficient fineness of consistency for the careful use of the limb within four weeks, but with the latter a period of from six weeks to two months is not too long to allow before removing the supporting apparatus from the limb.

This in general terms represents the fact when the resources of nature have not been thwarted by untoward accidents, such as a want of vigor in the constitution of the patient or a lack of skill on the part of the practitioner, and especially when, from any cause, the bony fragments have not been kept in a state of perfect immobility and the constant friction has prevented the osseous union of the two portions. Failures and misfortunes are always more than possible, and instead of a solid and practicable bony union the sequel of the accident is sometimes a *false joint*, composed of mere flexible cartilage, a poor *pseudo-arthrosis*. The explanation of this appears to be that, first, the sharp edges of the ends of the bone disappear by becoming rounded at their extremeties by friction and polishing against each other. Then follows an exudation of a plastic nature which becomes transformed into a cartilaginous layer of a rough articular aspect. In this bony nuclei soon appear, and the lymph secreted between the segments thus transformed, instead of be-

coming truly ossified, is changed into a sort of fibro-cartilaginous pouch or capsular sac, in which a somewhat albuminous secretion, or pseudo-synovia, permits the movement to take place. Most commonly, however, in our animals, the union of the bony fragments is obtained wholly through the medium of a layer of fibrous tissue, and it is because the union has been accomplished by a ligamentous formation only that motion becomes practicable.

The prognosis in a case of fracture in an animal is one of the gravest vital import to the patient, and therefore of serious pecuniary concern to his owner. The period has not long elapsed when to have received such a hurt was quite equivalent to undergoing a sentence of death for the suffering animal, and perhaps to-day a similar verdict is pronounced in many cases in which the exercise of a little mechanical ingenuity, with a due amount of careful nursing, might secure a contrary result and insure the return of the patient to his former condition of soundness and usefulness. Considered *per se*, a fracture in an animal is in fact no less amenable to treatment than the same description of injury in any other living being. But the question of the propriety and expediency of treatment is dependent upon certain specific points of collateral consideration.

First. The nature of the lesion itself is a point of paramount importance. A simple fracture occurring in a bone where the ends can be firmly secured in coaptation, presents the most favorable conditions for successful treatment. If it be that of a long bone it will be the less serious if situated at or near the middle of its length than if it were in close proximity to a joint, from the fact that perfect immobility can rarely, in the latter case, be secured without incurring the risk of subsequent rigidity of the joint.

A simple is always less serious than a compound fracture. A comminuted is always more dangerous than a simple, and a transverse break is easier to treat than one which is oblique. The most serious are those which are situated on parts of the body in which it is difficult to secure perfect immobility, and especially those which are accompanied by severe contusions and lacerations in the soft parts; the protrusion of fragments through the skin; the division of blood vessels by the broken ends of the bone; the existence of an articulation near the point to which inflammation is likely to extend; the luxation of a fragment of the bone; laceration of the periosteum; the presence of a large number of bony particles, the result of the crushing of the bone—all these are circumstances which discourage a favorable prognosis, and weigh against the hope of saving the patient for future usefulness.

Fractures which may be accounted curable are those which are not conspicuously visible, as those of the ribs, where displacements are either very limited or do not occur, the parts being kept *in situ* by the nature of their position, the shape of the bones, the articulations they form with the vertebra, the sternum, or their cartilages of prolonga-

tion; those of transverse processes of the lumbar vertebra; those of the bones of the face; those of the ilium; and that of the coffin bones. To continue the category, they are evidently curable when their position and the character of the patient contribute to aid the treatment. Those of the cranium, in the absence of cerebral lesions; those of the jaws; of the ribs, with displacement; of the hip; and those of the bone of the leg in movable regions, but where their vertical position admits of perfect coaptation.

On the contrary, a compound, complicated, or comminuted fracture, in whatever region it may be situated, may be accounted incurable.

In treating fractures time is an important element and "delays are dangerous." Those of recent occurrence unite more easily and more regularly than older ones.

Second. As a general rule, fractures are less serious in animals of the smaller species than in those of more bulky dimensions. This *influence of species* will be readily appreciated when we realize that the difficulties involved in the treatment of the latter class have hardly any existence in connection with the former. The difference in weight and size, and consequent facility in handling, and making the necessary applications of dressings and other appliances for the purpose of securing the indispensable immobility of the parts, and usually a less degree of uneasiness in the deportment of the patients are considerations in this connection of great weight.

Third. In respect to the utilization of the animal, the most obvious point in estimating the gravity of the case in a fracture accident is the certainty of the total loss of the services of the patient during treatment—certainly for a considerable period of time, perhaps permanently. For example, the fracture of the jaw of a steer just fattening for the shambles will involve a heavier loss than a similar accident to a horse. Usually the fracture of the bones of the extremities in a horse is a very serious casualty, the more so proportionately as the higher region of the limb is affected. In working animals it is exceedingly difficult to treat a fracture in such a manner as to restore a limb to its original perfection of movement. A fracture of a single bone of an extremity in a breeding stallion or mare will not necessarily impair their value as breeders. Other specifications under this head, though pertinent and more or less interesting, may be omitted.

Fourth. Age and temper are important factors of cure. A young, growing, robust patient, whose *vis vitæ* is active, is amenable to treatment which one with a waning constitution and past mature energies would be unable to endure, and a docile, quiet disposition will act coöperatively with remedial measures which would be neutralized by the fractious opposition of a peevish and intractable sufferer.

The fulfillment of three indications is indispensable in all fractures. The first is the reduction, or the replacement, of the parts as nearly as possible in their normal position. The second is their retention in that

position for a period sufficient for the formation of the provisional callus, and the third, which in fact is but an incident of the second, the careful avoidance of any accidents or causes of miscarriage which might disturb the curative process.

In reference to the first consideration, it must be remembered that the accident may befall the patient at a distance from his home, and his removal becomes the first duty to be attended to. Of course this must be done as carefully as possible. If he can be treated on the spot so much the better, though this is seldom practicable, and the method of removal becomes the question calling for settlement. But two ways present themselves—he must either walk or be carried. If the first, it is needless to say that every caution must be observed in order to obviate additional pain for the suffering animal, and to avoid any aggravation of the injury. Led slowly, and with partial support if practicable, the journey will not always involve untoward results. If he is carried it must be by means of a wagon, a truck, or an ambulance; the latter, being designed and adapted to the purpose, would of course be the preferable vehicle. As a precaution which should never be overlooked, a temporary dressing should first be applied. This may be so done as for the time to answer all the purpose of the permanent adjustment and bandaging. Without thus securing the patient, a fracture of an inferior degree may be transformed to one of the severest kind, and, indeed a curable changed to an incurable injury. We recall a case in which a fast trotting horse, after running away in a fright caused by the whistle of a locomotive, was found on the road limping with excessive lameness in the off fore leg, and walked with comparative ease some 2 miles to a stable before being seen by a surgeon. His immediate removal in an ambulance was advised, but before that vehicle could be procured the horse laid down, and upon being made to get upon his feet was found with a well-marked comminuted fracture of the os suffraginis, with considerable displacement. The patient, however, after long treatment, made a comparatively good recovery and though with a large bony deposit, a ringbone, was able to trot among the forties.

The two obvious indications in cases of fracture are *reduction*, or replacement, and *retention*.

In an incomplete fracture, where there is no displacement, the necessity of reduction does not exist. With the bone kept in place by an intact periosteum, and the fragments secured by the uninjured fibrous and ligamentous structure which surrounds them, there is no dislocation to correct. It is also at times rendered impossible by the seat of the fracture itself, by its dimensions alone, or by the resistance arising from the muscular contraction excited by the surgical manipulation. This is illustrated even in small animals, as in dogs, by the exceeding difficulty encountered in bringing the ends of a broken femur or humerus together, the muscular contraction being even in these animals sufficiently forcible to renew the displacement.

It is generally, therefore, only fractures of the long bones, and then at points not in close proximity to the trunk, that may be considered to be amenable to reduction. It is true that some of the more superficial bones, as those of the head, of the pelvis, and of the thoracic walls may in some cases require special manipulations and appliances for their retention in their normal positions, but the treatment of these and of a fractured leg can not be the same.

The methods of accomplishing reduction vary with the features of each case, the manipulations being necessarily modified to meet changing circumstances. If the displacement is in the thickness of the bone, as in transverse fracture, the manipulation of reduction consists in applying a steady pressure upon one of the fragments, while the other is kept steady in its place, the object of the pressure being the reëstablishment of the exact coincidence of the two bony surfaces. If the displacement has taken place at an angle it will be sufficient in order to effect the reduction to press upon the summit or apex of the angle until its disappearance indicates that the parts have been brought into coaptation. This method is often practiced in the treatment of a fractured rib. In a longitudinal fracture, or when the fragments are pressed together by the contraction of the muscles to which they give insertion until they so overlap as to correspond by certain points of their circumference, the reduction is to be accomplished by effecting the movements of *extension*, *counter-extension*, and *coaptation*. Extension is accomplished by making traction upon the lower portion of the limb. Counter-extension consists in firmly holding or confining the upper or body portion in such a manner that it shall not be affected by the traction applied to the lower; in simpler language, holding it motionless against the force exercised in the extension. In other words, the operator, grasping the limb below the fracture, draws it down or away from the trunk, while he seeks, not to draw away, but simply to hold still the upper portion until the broken ends of bone are brought to their natural relative positions when the coaptation, which is thus affected, has only to be made permanent by the proper dressings to perfect the reduction.

In treating fractures in small animals the strength of the hand is usually sufficient for the required manipulations. In the fracture of the forearm of a dog, for example, while the upper segment is firmly held by one hand, the lower may be grasped by the other and the bone itself made to serve the purpose of a lever to bring about the desired coaptation. In such a case that is sufficient to overcome the muscular contraction and correct the overlapping or other malposition of the bones. If, however, the resistance can not be overcome in this mode, the upper segment may be committed to an assistant for the management of the counter extension, leaving to the operator the free use of both hands for the further manipulation of the case.

But if the reduction of fractures in small animals is an easy task, it

is far from being so when a large animal is the patient, whose muscular force is largely greater than that of several men combined. In such a case resort must be had not only to superior numbers for the necessary force, but in many cases to mechanical aids. A reference to the mode of proceeding in a case of fracture with displacement of the fore arm of a horse will illustrate the matter. The patient is first to be carefully cast, on the uninjured side, with ropes, or a broad leather strap about 18 feet long, passed under and around his body and under the axilla of the fractured limb and secured at a point opposite to the animal and toward his back. This will form the mechanical means of counter extension. Another rope will then be placed around the inferior part of the leg below the point of fracture, with which to produce extension, and this will sometimes be furnished with a block or pullies, in order to augment the power when necessary, and there is, in fact, always an advantage in their use, on the side of steadiness and uniformity, as well as of increased power. It is secured around the fetlock or the coronet, or what is better, above the knee and nearer the point of fracture, and is committed to assistants. The traction on this should be firm, uniform, and slow, without relaxing or jerking, while the operator carefully watches the process. If the bone is superficially situated he is able to judge by the eye of any changes that may occur in the form or length of the parts under traction, and discovering at the moment of its happening the restoration of symmetry in the disturbed region, he gently but firmly manipulates the place until all appearance of severed continuity have vanished. Sometimes the fact and the instant of restoration are indicated by a peculiar sound, or "click," as the ends of the bone slip into contact, to await the next step of the restorative procedure.

The process is the same when the bones are covered with thick muscular masses, excepting that it is attended with greater difficulties, from the fact that the finger must be substituted for the eye, and the taxis must take the place of the sight, and the result naturally becomes more uncertain.

It frequently happens that perfect coaptation is prevented by the interposition between the bony surfaces of substances, such as a small fragment of detached bone or a clot of blood, and sometimes the extreme obliquity of the fracture is the opposing cause, by permitting the bones to slip out of place. These are difficulties which can not always be overcome, even in small-sized animals, and still it is only when they are mastered that a correct consolidation can be looked for. Yet without it the continuity between the fragments will be by a deformed callus, the union will leave a shortened, crooked or angular limb, and a disabled animal.

If timely assistance can be obtained, and the reduction accomplished immediately after the occurrence of the accident, that is the best time for it. But if it can not be attended to until inflammation has become

established and the parts have become swollen and painful, time must be allowed for the subsidence of these symptoms before attempting the operation. A spasmodic muscular contraction which sometimes interposes a difficulty may be easily overcome by subjecting the patient to general anesthesia, and need not, therefore, cause any loss of time. A tendency to this may also be overcome by the use of sedatives and antiphlogistic remedies.

The reduction of the fracture having been accomplished, the problem which follows is that of *retention*. The parts which have been restored to their natural position must be kept there, without disturbance or agitation, until the perfect formation of a callus, and it is here that ample latitude exists for the exercise of ingenuity and skill by the surgeon in the contrivance of the necessary apparatus. One of the most important of the conditions which are available by the surgeon in treating human patients is denied to the veterinarian in the management of those which belong to the animal tribes. This is *position*. The intelligence of the human patient co-operates with the instructions of the surgeon, but with the animal sufferer there is a continual antagonism between the parties, and the forced extension and fatiguing position which must for a considerable period be maintained as a condition of restoration require special and effective appliances to insure successful results. To obtain complete immobility is scarcely possible, and the surgeon must be content to reach a point as near as possible to that which is unattainable. For this reason, as will subsequently be seen, the use of slings and the restraint of patients in very narrow stalls is much to be preferred to the practice sometimes recommended, of allowing entire freedom of motion by turning them loose in box stalls. . Temporary and movable apparatus are not usually of difficult use in veterinary practice, but the restlessness of the patients and their unwillingness to submit quietly to the changing of the dressings render it obligatory to have recourse to permanent and immovable bandages, which should be retained without disturbance until the process of consolidation is complete.

The materials composing the retaining apparatus consist of oakum, bandages, and splints, with an agglutinating compound which forms a species of cement by which the different constituents are blended into a consistent mass to be spread upon the surface covering the locality of the fracture. Its components are black pitch, rosin, and Venice turpentine, blended by heat. The dressing may be applied directly to the skin, or a covering of thin linen may be interposed. A putty made with powdered chalk and the white of egg is recommended for small animals, though a mixture of sugar of lead and burnt alum with the albumen is preferred by others. Another formula is spirits of camphor, Goulard's extract and albumen. Another recommendation is to saturate the oakum and bandages with an adhesive solution formed with gum arabic, dextrine, flour paste, or starch. This is advised particularly

for small animals. Dextrine mixed, while warm, with burnt alum and alcohol cools and solidifies into a stony consistency, and is preferable to plaster of Paris, which is less friable and has less solidity, besides being heavier and requiring constant additions as it becomes older. Starch and plaster of Paris form another good compound.

In applying the dressing the leg is usually padded with a cushion of oakum, thick and soft enough to equalize the irregularities of the surface and to form a bedding for the protection of the skin from chafing. Over this the splints are placed. The material for these is, variously, pasteboard, thin wood, bark, laths, gutta percha, strips of thin metal, as tin or perhaps sheet iron. These should be of sufficient length not only to cover the region of the fracture, but to extend sufficiently above and below to render the immobility more complete than in the surrounding joints. The splints, again, are covered with cloth bandages, linen preferably, soaked in a glutinous moisture. These bandages are to be carefully applied, with a perfect condition of lightness. They are usually made to embrace the entire length of the leg, in order to avoid the possibility of interference with the circulation of the extremity, as well as for the prevention of chafing. They should be rolled from the lower part of the leg upwards, and carefully secured against loosening. In some instances suspensory bandages are recommended, but excepting for small animals our experience does not justify a concurrence in the recommendation.

These permanent dressings always need careful watching with reference to their immediate effect upon the region they cover, especially during the first days succeeding that of their application. Any manifestation of pain, or any appearance of swelling above or below, or any odor suggestive of suppuration should excite suspicion, and a thorough investigation should follow without delay. The removal of the dressing should be performed with great care, and especially so if time enough has elapsed since its application to allow of a probability of a commencement of the healing process or the existence of any points of consolidation. With the original dressing properly applied in its entirety in the first instance, the entire extremity will have lost all chance of mobility, and the repairing process may be permitted to proceed without interference. There will be no necessity and there need be no haste for removal or change except under such special conditions as have just been mentioned, or when there is reason to judge that solidification has become perfect, or for the comfort of the animal, or for its readaptation in consequence of the atrophy of the limb from want of use. Owners of animals are often tempted to remove a splint or bandage prematurely at the risk of producing a second fracture in consequence of the failure of the callus properly to consolidate.

The method of applying the splints which we have described refers to the simple variety only. In a compound case the same rules must be observed, with the modification of leaving openings through the

thickness of the dressing, opposite the wound, in order to permit the escape of pus and to secure access to the points requiring the application of treatment.

FRACTURE OF DIFFERENT BONES.

Of the cranial bones.—Fractures of this variety in large animals are comparatively rare, though the records are not destitute of cases. When they occur, it is as the result of external violence, the sufferers being usually runaways which have come in collision with a wall or a tree, or other obstruction; or it may occur in those which in pulling upon the halter have broken it with a jerk and been thrown backwards, as might occur in rearing too violently. Under these conditions we have witnessed fractures of the parietal, of the frontal, and of the sphenoid bones. These fractures may be of both the complete and the incomplete kind, which indeed is usually the case with those of the flat bones, and they are liable to be complicated with lacerations of the skin, in consequence of which they are easily brought under observation. But when the fact is otherwise and the skin is intact, the diagnosis becomes difficult. The incomplete variety may be unaccompanied by any special symptoms, but in the complete kind one of the bony plates may be so far detached as to press upon the cerebral substance with sufficient force to produce serious nervous complications. When the injury occurs at the base of the cranium hemorrhage may be looked for, with paralytic symptoms, and when these are present the usual termination is death. It may still happen, however, that the symptoms of an apparently very severe concussion may disappear, with the result of an early and complete recovery, and the surgeon will therefore do well to avoid undue precipitation in venturing upon a prognosis. In fractures of the orbital or the zygomatic bones the danger is less pressing than with injuries otherwise located about the head. The treatment of cranial fractures is simple, though involving the best skill of the experienced surgeon. When incomplete, hardly any interference is needed; even plain bandaging may usually be dispensed with. In the complete variety the danger to be combated is compression of the brain, and attention to this indication must not be delayed. The means to be employed are the trephining of the skull over the seat of the fracture, and the elevation of the depressed bone or the removal of the portion which is causing the trouble. Fragments of bone in comminuted cases, bony exfoliations, collections of fluid, or even protruding portions of the brain substance must be carefully cleansed away, and a simple bandage so applied as to facilitate the application of subsequent dressings.

Fractures of the bones of the face.—In respect to their origin—usually traumatic—these injuries rank with the preceding, and are commonly of the incomplete variety. They may easily be overlooked and may even sometimes escape recognition until the reparative process has been well

established and the discovery of the wound becomes due to the prominence caused by the presence of the provisional callus which marks its cure. When the fracture is complete it will be marked by local deformity, mobility of the fragments, and crepitation. Nasal hemorrhage, roaring, frequent sneezing, loosening or loss of teeth, difficulty of mastication, and inflammation of the cavities of the sinuses are varying complications of these accidents. The object of the treatment should be the restoration of the depressed bones as nearly as possible to their normal position, and their retention in place by protecting splints, which should cover the entire facial region. And special precautions should be observed to prevent the patient from disturbing the dressing by rubbing his head against surrounding objects, such as the stall, the manger, the rack, etc. Clots of blood in the nasal passages must be washed out, collections of pus must be removed from the sinuses, and if the teeth are loosened and likely to fall out, they should be removed. If roaring is threatened, tracheotomy is indicated.

Fractures of the pre-maxillary bone.—These are mentioned by continental authors. They are usually encountered in connection with fractures of the nasal bone, and may take place either in the width or the length of the bone.

The deformity of the upper lip, which is drawn sidewise in this lesion, renders it easy of diagnosis. The abnormal mobility and the crepitation, with the pain manifested by the patient when undergoing examination, are concurrent symptoms. Looseness of the teeth, abundant salivation, and entire inability to grasp the food complete the symptomatology of these accidents. In the treatment, splints of gutta percha or leather are sometimes used, but they are of difficult application. Our own judgment and practice are in favor of the union of the bones by means of metallic sutures.

The lower jaw.—A fracture here is not an injury of infrequent occurrence. It involves the body of the bone, at its symphysis, or back of it, and includes one or both of its branches, either more or less forward, or at the posterior part, near the temporo-maxillary articulation, at the coronoid process.

Falls, blows, or other external violence, or powerful muscular contractions during the use of the speculum, may be mentioned among the causes of this lesion. The fracture of the neck and of the branches in front of the cheeks causes the lower jaw, the true dental arch, to drop, without the ability to raise it again to the upper, and the result is a peculiar and characteristic physiognomy. The prehension and mastication of food become impossible; there is an abundant escape of fetid and sometimes bloody saliva, especially if the gums have been wounded; there is excessive mobility of the lower end of the jawbone; and there is crepitation, and frequently paralysis of the under lip. But although the aspect of an animal suffering with a complete and often compound and comminuted fracture of the submaxilla presents at times

bring about a union by the first intention, and in another the work will be accompanied by suppuration, or the union by the second intention, a process so familiar in the repair of the soft structures by granulation.

Considering the process in its simplest form, in a case in which it advances without interruption or complication to a favorable result it may probably be correctly described in this wise:

On the occurrence of the injury an effusion of blood takes place between the ends of the bone. The coagulation of the fluid soon follows, and this, after a few days, undergoes absorption. There is then an excess of inflammation in the surrounding structure, which soon spreads to the bony tissue, when a true ostitis is established, and the compact tissue of the bone becomes the seat of a new vascular organization, and of a certain exudation of plastic lymph, appearing between the periosteum and the external surface of the bone, as well as on the inner side of the medullary cavity. After a few days the ends of the bone thus surrounded by this exudate become involved in it, and the lymph, becoming vascular, is soon transformed into cartilaginous, and in due time into bony tissue.

Thus the time required for the consolidation of the fractured segments is divisible into two distinct periods. In the first they are surrounded by an external bony ring, and the medullary cavity is closed by a bony plug or stopper, constituting the period of the *provisional callus*. This is followed by the period of *permanent callus*, during which the process is going forward of converting the cartilaginous into the osseous form.

The restorative process is sooner completed in the carnivorous than in the herbivorous tribes. In the former the temporary callus may attain sufficient fineness of consistency for the careful use of the limb within four weeks, but with the latter a period of from six weeks to two months is not too long to allow before removing the supporting apparatus from the limb.

This in general terms represents the fact when the resources of nature have not been thwarted by untoward accidents, such as a want of vigor in the constitution of the patient or a lack of skill on the part of the practitioner, and especially when, from any cause, the bony fragments have not been kept in a state of perfect immobility and the constant friction has prevented the osseous union of the two portions. Failures and misfortunes are always more than possible, and instead of a solid and practicable bony union the sequel of the accident is sometimes a *false joint*, composed of mere flexible cartilage, a poor *pseudo-arthrosis*. The explanation of this appears to be that, first, the sharp edges of the ends of the bone disappear by becoming rounded at their extremeties by friction and polishing against each other. Then follows an exudation of a plastic nature which becomes transformed into a cartilaginous layer of a rough articular aspect. In this bony nuclei soon appear, and the lymph secreted between the segments thus transformed, instead of be-

coming truly ossified, is changed into a sort of fibro-cartilaginous pouch or capsular sac, in which a somewhat albuminous secretion, or pseudo-synovia, permits the movement to take place. Most commonly, however, in our animals, the union of the bony fragments is obtained wholly through the medium of a layer of fibrous tissue, and it is because the union has been accomplished by a ligamentous formation only that motion becomes practicable.

The prognosis in a case of fracture in an animal is one of the gravest vital import to the patient, and therefore of serious pecuniary concern to his owner. The period has not long elapsed when to have received such a hurt was quite equivalent to undergoing a sentence of death for the suffering animal, and perhaps to-day a similar verdict is pronounced in many cases in which the exercise of a little mechanical ingenuity, with a due amount of careful nursing, might secure a contrary result and insure the return of the patient to his former condition of soundness and usefulness. Considered *per se*, a fracture in an animal is in fact no less amenable to treatment than the same description of injury in any other living being. But the question of the propriety and expediency of treatment is dependent upon certain specific points of collateral consideration.

First. The nature of the lesion itself is a point of paramount importance. A simple fracture occurring in a bone where the ends can be firmly secured in coaptation, presents the most favorable conditions for successful treatment. If it be that of a long bone it will be the less serious if situated at or near the middle of its length than if it were in close proximity to a joint, from the fact that perfect immobility can rarely, in the latter case, be secured without incurring the risk of subsequent rigidity of the joint.

A simple is always less serious than a compound fracture. A comminuted is always more dangerous than a simple, and a transverse break is easier to treat than one which is oblique. The most serious are those which are situated on parts of the body in which it is difficult to secure perfect immobility, and especially those which are accompanied by severe contusions and lacerations in the soft parts; the protrusion of fragments through the skin; the division of blood vessels by the broken ends of the bone; the existence of an articulation near the point to which inflammation is likely to extend; the luxation of a fragment of the bone; laceration of the periosteum; the presence of a large number of bony particles, the result of the crushing of the bone—all these are circumstances which discourage a favorable prognosis, and weigh against the hope of saving the patient for future usefulness.

Fractures which may be accounted curable are those which are not conspicuously visible, as those of the ribs, where displacements are either very limited or do not occur, the parts being kept *in situ* by the nature of their position, the shape of the bones, the articulations they form with the vertebra, the sternum, or their cartilages of prolonga-

a frightful spectacle, the prognosis of the case is comparatively simple, and recovery usually only a question of time. The severity of the lesion corresponds in degree with that of the violence to which it is due, the degree of simplicity or the amount of complication, and with the situation of the wound. It is simple when at the symphysis, but becomes more serious when it affects one of the branches, to be again aggravated when both are involved. Fracture of the coronoid process becomes important principally as an evidence of the existence of a morbid diathesis, such as osteo-porosis, or the like.

The particular seat of the injury, with its special features, will of course determine the treatment. For a simple fracture without displacement, provided there is no laceration of the periosteum, an ordinary supporting bandage will usually be sufficient. But when there is displacement the reduction of the fracture must first be accomplished, and for this special splints are necessary. In a fracture of the symphysis or of the branches the adjustment of the fragments by securing them with metallic sutures is the first step necessary, to be followed by the application of supports, consisting of splints of leather or sheets of metal, the entire front of the head being then covered with bandages prepared with adhesive mixtures. During the entire course of treatment a special method of feeding becomes necessary. The inability of the patient to appreciate the situation of course necessitates a resort to an artificial mode of introducing the necessary food into his stomach, and it is accomplished by forcing between the commissures of the lips, in a liquid form, by means of a syringe, the milk or nutritive gruels selected for his sustenance, until the consolidation is sufficiently advanced to permit the ingestion of food of a more solid consistency. The callus will usually be sufficiently hardened in two or three weeks to allow of a change of diet to mashes of cut hay and scalded grain, until the removal of the dressing restores him to his old habit of mastication.

Fractures of vertebræ.—These are not very common, but when they do occur the bones most frequently injured are those of the back and loins. The ordinary causes of fracture are responsible here as elsewhere, such as heavy blows on the spinal column, severe falls while conveying heavy loads, and especially violent efforts in resisting the process of casting. Although occurring more or less frequently under the latter circumstances, the accident is not always attributable to carelessness or error in the management. It may, of course, sometimes result from such a cause as a badly prepared bed, or the accidental presence of a hard body concealed in the straw, or to a heavy fall when the movements of the patient have not been sufficiently controlled by an effective apparatus and its skillful adaptation, but it is quite as likely to be caused by the violent resistance and the consequent powerful muscular contraction by the frightened patient. The simple fact of the overarching of the vertebral column, with excessive pressure against it from the intestinal mass, owing to the spasmodic action of the abdominal muscles,

may account for it, and so also may the struggles of the animal to escape from the restraint of the hobbles while frantic under the pain of an operation without anæsthesia. In these cases the fracture usually occurs in the body or the annular part, or both, of the posterior dorsal or the anterior lumbar vertebra. When the transverse processes of the last-named bones are injured, it is probably in consequence of the heavy concussion incident to striking the ground when cast. The diagnosis of a fracture of the body of a vertebra is not always easy, especially when quite recent, and more especially when there is no accompanying displacement. There are certain peculiar signs accompanying the occurrence of the accident while an operation is in progress which should at once excite the suspicion of the surgeon. In the midst of a violent struggle the patient becomes suddenly quiet; the movement of a sharp instrument which at first excited his resistance fails to give rise to any further evidence of sensation; perhaps a general trembling, lasting for a few minutes, will follow, succeeded by a cold, profuse perspiration, particularly between the hind legs, and frequently there will be micturition and defecation. Careful examination of the vertebral column may then detect a slight depression or irregularity in the direction of the spine, and there may be a diminution or loss of sensation in the posterior part of the trunk while the anterior portion continues to be as sensitive as before. In making an attempt to get upon his feet, however, upon the removal of the hobbles, only the fore part of the body will respond to the effort, a degree of paraplegia being present, and while the head, neck, and fore part of the body will be raised, the hind quarters and hind legs will remain inert. The animal may perhaps succeed in rising and probably may be removed to his stall, but the displacement of the bone will follow, converting the fracture into one of the complete kind, either through the exertion of walking or by a renewed attempt to rise after another fall, before reaching his stall. By this time the paralysis is complete, and the extension of the meningitis which has become established is a consummation soon reached.

To say that the prognosis of fracture of the body of the vertebræ is always serious is to speak very mildly. It were better perhaps to say that *occasionally* a case *may* recover. Fractures of the transverse processes are less serious.

Instead of stating the indication in this class of cases, as if assuming them to be medicable, the question naturally becomes rather a query: "Can any treatment be recommended in a fracture of the body of a vertebra?" The only indication in such a case, in our opinion, is to reach the true diagnosis in the shortest possible time and to act accordingly. If there is displacement, and the existence of serious lesions may be inferred from the nervous symptoms, the destruction of the suffering animal appears to suggest itself as the one conclusion in which considerations of policy, humanity, and science at once unite.

If, however, it is fairly evident that no displacement exists; that

pressure upon the spinal cord is not yet present; that the animal with a little assistance is able to rise upon his feet and to walk a short distance, it may be well to experiment upon the case to the extent of placing the patient in the most favorable circumstances for recovery, and allow nature to operate without further interference. This may be accomplished by securing immobility of the whole body as much as possible, and especially of the suspected region, by placing the patient in slings, in a stall sufficiently narrow to preclude lateral motion, and covering the loins with a thick coat of agglutinative mixture, watch and wait for developments.

Fracture of the ribs.—The different regions of the chest are not equally exposed to the violence to which fractures of the ribs are due, and they are therefore either more common or more easily discovered, during life, at some points than at others. The more exposed regions are the middle and the posterior, while the front is largely covered and defended by the shoulder. A single rib may be the seat of fracture, or a number may be involved, and there may be injuries on both sides of the chest at the same time. It may take place lengthwise, in any part of the bone, though the middle, being the most exposed, is the most frequently hurt. Incomplete fractures are usually lengthwise, involving a portion only of the thickness or one or other of the surfaces. The complete kind may be either transverse or oblique, and are most commonly denticulated. The fracture may be comminuted, and a single bone may show one of the complete and one of the incomplete kind, at different points. The extent of surface presented by the thoracic region, with its complete exposure at all points, explains the liability of the ribs to suffer from all the forms of external violence.

In many instances fractures of these bones continue undiscovered, especially the incomplete variety, without displacement, though the evidences of local pain, a certain amount of swelling and a degree of disturbance of the respiration, if noticed during the examination of a patient, may suggest a suspicion of their existence. Abnormal mobility and crepitation are difficult of detection, even when present, and they are not always present. When there is displacement the deformity which it occasions will betray the fact, and when such an injury exists the surgeon will of course become vigilant in view of possible and probable complications of thoracic trouble, and prepare himself for an encounter with a case of traumatic pleuritis or pneumonia. Fatal injuries of the heart are recorded. Subcutaneous emphysema is a common accompaniment of broken ribs, and we recall the death from this cause of a patient of our own, which had suffered a fracture of two ribs in the region of the withers under the cartilages of the shoulder, and of which the diagnosis was only made after the fatal ending of the case.

These hurts are not often of a very serious character, though the union is never as solid and complete as in other fractures, the callus

being usually imperfect and of a fibrous character, with an amphiarthrosis formation. · Still, complications occur which may impart gravity to the prognosis.

Fractures with but a slight or no displacement need no reduction. All that is necessary is a simple application of a blistering nature as a preventive of inflammation or for its subjugation when present, and in order to excite an exudation which will tend to aid in the support and immobilization of the parts. At times, however, a better effect is obtained by the application of a bandage placed firmly around the chest, although, while this limits the motion of the ribs, it is apt to render the respiration more labored.

If there is displacement with much accompanying pain and evident irritation of the lungs, the fracture must be reduced without delay. The means of effecting this vary according to whether the displacement is outwards or inwards. In the first case the bone may be straightened by pressure from without, while in the second the end of the bone must be raised by a lever, for the introduction of which a small incision through the skin and intercostal spaces will be necessary. When coaptation has been affected it must be retained by the external application of adhesive mixture, with splints and bandages around the chest.

Fractures of the bones of the pelvis will be considered under their separate denominations, as those of the *sacrum* and the *os innominata*, or hip, which includes the subdivisions of the ilium, the pubes, and the ischium.

The sacrum.—Fractures of this bone are rarely met with among solipeds. Among cattle, however, it is of common occurrence, being attributed not only to the usual varieties of violence, as blows and other external hurts, but to the act of coition, and to violent efforts in parturition. It is generally of the transverse kind, and may be recognized by the deformity which it occasions. This is due to the dropping of the bone, with a change in its direction and a lower attachment of the tail, which also becomes more or less paralyzed. The natural and spontaneous relief which usually interposes in these cases has doubtless been observed by the extensive cattle breeders of the West, and their practice and example fully establishes the inutility of interference. Still, cases may occur in which reduction may be indicated, and it then becomes a matter of no difficulty. It is effected by the introduction of a round, smooth piece of wood into the rectum as far as the fragment of bone, and using it as a lever, resting it upon another as a fulcrum placed under it outside. The bone having been thus returned may be kept in place by the ordinary external means in use.

The os innominata.—Fractures of the ilium may be observed either at the angle of the hip or at the neck of the bone; those of the pubes may take place at the symphysis, or in the body of the bone; those of the ischium on the floor of the bone, or at its posterior external angle. Or, again, the fracture may involve all three of these constituent parts of

the hip bone by having its situation in the articular cavity—the acetabulum by which it joins the femur or thigh bone.

Some of these fractures are easily recognized, while others are difficult to identify. The ordinary deformity which characterizes a fracture of the external angle of the ilium, its dropping and the diminution of that side of the hip in width, unite in indicating the existence of the condition expressed by the term "hipped." But an incomplete fracture, or one that is complete without displacement, or even one with displacement, often demands the closest scrutiny for its discovery. The lameness may be well marked, and an animal may show but little appearance of it while walking, but upon being urged into a trot will manifest it more and more, until presently he will cease to use the crippled limb altogether, and perform his traveling entirely on three legs. The acute character of the lameness will vary in degree as the seat of the lesion approximates the acetabulum. In walking, the motion at the hip is very limited, and the leg is dragged, while at rest it is relieved from bearing its share in sustaining the body. An intelligent opinion and correct conclusion will depend largely upon a knowledge of the history of the case, and while in some instances that will be but a report of the common etiology of fractures, such as blows, hurts, and other external violence, the simple fact of a fall may furnish in a single word a satisfactory solution of the whole matter.

With the exception of the deformity of the ilium in a fracture of its external angle, and unless there have been a serious laceration of tissues and infiltration of blood, or excessive displacement, there are no very definite external symptoms in a case of a fracture of the hip bone. There is one, however, which, in a majority of cases, will not fail—it is crepitation. This evidence is attainable by both external and internal examination—by manipulation of the gluteal surface and by rectal taxis. Very often a lateral motion, or balancing of the hinder parts by pressing the body from one side to the other, will be sufficient to render the crepitation more distinct—a slight sensation of grating, which may be perceived even through the thick coating of muscle which covers the bone—and the sensation may not only be felt, but to the ear of the expert may even become audible. This external manifestation is, however, not always sufficient in itself, and should always be associated with the rectal taxis for corroboration. It is true that this may fail to add to the evidence of fracture, but till then the simple testimony afforded by the detection of crepitation from the surface, though a strong confirmatory point, is scarcely sufficiently absolute to establish more than a reasonable probability or strong suspicion in the case.

In addition to the fact that the rectal examination brings the exploring hand of the surgeon into near proximity to the desired point of search, and to an accurate knowledge of the situation of parts, both *pro* and *con* as respects his own views, there is another advantage attendant upon it which is well entitled to appreciation. This is the facility

with which he can avail himself of the coöperation of an assistant, who can aid him by manipulating the implicated limb and placing it in various positions, so far as the patient will permit, while the surgeon himself is making explorations and studying the effect from within. By this method he can hardly fail to ascertain the character of the fracture and the condition of the bony ends. By the rectal taxis, as if with eyes in the finger ends, he will "see" what is the extent of the fracture of the ilium or of the neck of that bone; to what part of the central portion of the bone (the acetabulum) it reaches; whether this is free from disease or not, and in what location on the floor of the pelvis the lesion is situated. We have frequently, by this method, been able to detect a fracture at the symphysis, which from its history and symptoms and an external examination, could only have been guessed at.

Yet, with all its advantages, the rectal examination is not always necessary, as, for example, when the fracture is at the posterior and external angle of the ischium, when by friction of the bony ends the surgeon may discern the crepitation without it.

Every variety of complication, including muscular lacerations with the formation of deep abscesses and injuries to the organs of the pelvic cavity, the bladder, the rectum, and the uterus, may be associated with fractures of the hip bone.

The prognosis of these lesions will necessarily vary considerably. A fracture of the most superficial part of the bone of the ilium or of the ischium, especially where there is little displacement, will unite rapidly, leaving a comparatively sound animal often quite free from subsequent lameness. But if there is much displacement, only a ligamentous union will take place, with much deformity and more or less irregularity in the gait. Other fractures may be followed by complete disability of the patient, as, for example, when the cotyloid cavity is involved, or when the reparatory process has left bony deposits in the pelvic cavity at the seat of the union, which may, with the female, interfere with the steps of parturition, or induce some local paralysis by pressure upon the nerves which govern the muscles of the hind legs. This is a condition not infrequently observed when the callus has been formed on the floor of the pelvis near the obturator foramen, pressing upon the course or involving the obturator nerve.

The treatment of all fractures of the hip bone should, in our estimation, be of the simplest kind. Rendered comparatively immovable by the thickness of the muscles by which the region is enveloped, one essential indication suggests itself, and that is, to place the animal in a position which, as far as possible, will be fixed and permanent. For the accomplishment of this purpose the best measure, as we consider it, is to place him in a stall of just sufficient width to admit him, and to apply a set of slings snugly, but comfortably. This will fulfill the essential conditions of recovery, rest, and immobility. Blistering applications would be injurious, though the adhesive mixture might prove in some degree beneficial.

The minimum period allowable for solid union in a fractured hip is, in our judgment, two months, and we have known cases in which that was too short a time.

As we have before said, there may be cases in which the treatment for fracture at the floor of the pelvis has been followed by symptoms of partial paralysis, the animal, when lying down, being unable to regain his feet, but moving freely when placed in an upright position. This condition is due to the interference of the callus with the functions of the obturator nerve, which it presses upon or surrounds. We feel warranted by our experience in similar cases in cautioning owners of horses in this condition to exercise due patience, and to avoid a premature sentence of condemnation against their invalid servants; they are not all irrecoverably paralytic. With alternations of moderate exercise, rest in the slings, and the effect of time while the natural process of absorption is taking effect upon the callus, with other elements of change that may be so operating, the horse may in due time become able to once more earn his subsistence and serve his master.

Fracture of the scapula.—This bone is seldom fractured, its comparative exemption being due to its free mobility and the protection it receives from the superimposed soft tissues. Only direct and powerful causes are sufficient to effect the injury, and when it occurs the large rather than the smaller animals are the subjects. The causes are heavy blows or kicks, and violent collisions with unyielding objects. Those which are occasioned by falls are generally at the neck of the bone, and of the transverse and comminuted varieties.

The diagnosis is not always easy. The symptoms are inability to rest the leg on the ground and to carry weights, and they are present in various degrees from slight to severe The leg rests upon the toe and seems shortened, and locomotion is performed by jumps. Moving the leg while examining it and raising the foot for inspection seem to produce much pain and cause the animal to rear. Crepitation is readily felt with the hand upon the shoulder when the leg is moved. If the fracture occurs in the upper part of the bone, overlapping of the fragments and displacement will be considerable.

The fracture of this bone is usually classed among the more serious accidents, though cases may occur which are followed by recovery without very serious ultimate results, especially when the seat of the injury is at some of the upper angles of the bone, or about the acromion crest. But if the neck and the joint are the parts involved, complications are apt to be present which are likely to disable the animal for life.

If there is no displacement a simple adhesive dressing, to strengthen and immobilize the parts, will be sufficient. A coat of black pitch dissolved with wax and Venice turpentine, and kept in place over the region with oakum or linen bands, will be all the treatment required, especially if the animal is kept quiet in the slings.

Displacement cannot be remedied, and reduction is next to impos-

sible. Sometimes an iron plate is applied over the parts and retained by bandages, as in the dressing of Bourgelat; and this may be advantageously replaced by a pad of thick leather. In smaller animals the parts are retained by figure-8 bandages, embracing both the normal and the diseased shoulders, crossing each other in the axilla and covered with a coating of adhesive mixture.

Fractures of the humerus.—These are more common in small than in large animals, and are always the result of external traumatism. They are generally very oblique, are often comminuted, and though more usually involving the shaft of the bone will in some cases extend to the upper end and into the articular head. There is ordinarily considerable displacement in consequence of the overlapping of the broken ends of the bone, and this, of course, causes more or less shortening of the limb. There will also be swelling, with difficulty of locomotion, and crepitation will be easy of detection. This fracture is always a serious damage to the patient, leaving him with a permanently shortened limb and a remediless, lifelong lameness.

If treatment is determined on it will consist in the reduction of the fracture by means of extension and counter extension, and in order to accomplish this the animal must be thrown. If successful in the reduction, then follows the application and adjustment of the apparatus of retention, which must needs be of the most perfect and efficient kind. And finally, this, however skillfully contrived and carefully adapted, will often fail to effect any good purpose whatever.

Fracture of the forearm.—A fracture in this region may also involve the radius or the cubitus, the first being broken at times in its upper portion above the radio-cubital arch at the olecranon. If the fracture occurs at any part of the forearm from the radio-cubital arch down to the knee, it may involve either the radius alone or the radius and the cubitus, which are there intimately united.

Besides having the same etiology with most of the fractures, those of the forearm are, nevertheless, more commonly due to kicks from other animals, especially when crowded together in large numbers in insufficient space. It is a matter of observation that, under these circumstances, fractures of the incomplete kind are those which occur on the inside of the leg, the bone being in that region almost entirely subcutaneous, while those of the complete class are either oblique or transverse. The least common are the longitudinal, in the long axis of the bone.

This variety of fracture is easily recognized by the appearance of the leg and the different changes it undergoes. There is inability to use the limb; impossibility of locomotion; mobility below the injury; the ready detection of crepitation—in a word, the assemblage of all the signs and symptoms which have been already considered as associated with the history of broken bones.

The fracture of the cubitus alone, principally above the radio-cubital

arch, may be ascertained by the aggravated lameness, the excessive soreness on pressure, and perhaps a certain increase of motion, with a very slight crepitation if tested for in the usual way. Displacement is not likely to take place except when it is well up towards the olecranon or its tuberosity, the upper segment of the bone being in that case likely to be drawn upwards. For a simple fracture of this region there exists a fair chance of recovery, but in a case of the compound and comminuted class there is less ground for a favorable prognosis, especially if the elbow joint has suffered injury. A fracture of the cubitus alone is not of serious importance, except when the same conditions prevail. A fracture of the olecranon is less amenable to treatment, and promises little better than a ligamentous union.

Considering all the various conditions involving the nature and extent of these lesions, the position and direction of the bones of the forearm are such as to render the chances for recovery from fracture as among the best. The reduction, by extension and counter extension; the maintenance of the coaptation of the segments; the adaptation of the dressing by splints, oakum, and agglutinative mixtures; in a word, all the details of treatment may be here fulfilled with a degree of facility and precision not attainable in any other part of the organism. An important if not an essential point, however, must be emphasized in regard to the splints. Whether these are of metal, wood, or other material, they should reach from the elbow joint to the ground, and should be placed on the posterior face and on both sides of the leg. This is then to be so confined in a properly constructed box as to preclude all possibility of motion, while yet it must sustain a certain portion of the weight of the body. The iron splint (represented in Plate XXVII) recommended by Bourgelet is designed for fractures of the forearm, of the knee, and of the cannon bone, and will prove to be an appliance of great value. For small animals our preference is for an external covering of gutta percha, embracing the entire leg. A sheet of this substance of suitable thickness, according to the size of the animal, softened in lukewarm water, is, when sufficiently pliable, molded on the outside of the leg, and when suddenly hardened by the application of cold water forms a complete casing sufficiently rigid to resist all motion. Patients treated in this manner have been able to use the limb freely, without pain, immediately after the application of the dressing. The removal of the splint is easily effected by cutting it away, either wholly or in sections, after softening it by immersing the leg in a warm bath.

Fracture of the knee.—This accident, happily, is of rare occurrence, but when it takes place is of a severe character, being of the comminuted kind, and always accompanied by synovitis, with disease of the joint, requiring for treatment therefor, besides the indication of perfect immobility of the joint, that of open joints, synovitis, and arthritis.

Fracture of the femur.—The protection which this bone receives from

the large mass of muscles in which it is enveloped does not suffice to invest it with immunity in regard to fractures. It contributes its share to the list of accidents of this description, sometimes in consequence of external violence and sometimes as the result of muscular contraction; sometimes it takes place at the upper extremity of the bone; sometimes at the lower; sometimes at the head, when the condyles become implicated; but it is principally found in the body or diaphysis. The fracture may be of any of the ordinary forms, simple or compound, complete or incomplete, transverse or oblique, etc. A case of the comminuted variety is recorded in which eighty-five fragments of bone were counted and removed.

The thickness of the muscular covering sometimes renders the diagnosis difficult by interfering with the manipulation, but the crepitation test is readily available even when the swelling is considerable and which is likely to be the case as the result of the interstitial hemorrhage which naturally follows the laceration of the blood vessels of the region involved. If the fracture is at the neck of the bone the muscles of that region (the gluteal) are firmly contracted and the leg seems to be shortened in consequence. Locomotion is impossible. Crepitation may in some cases be discerned by rectal examination, with one hand resting over the coxo-femoral (hip) articulation. Fractures of the tuberosities of the upper end of the bone, the great trochanter, may be identified by the deformity, the swelling, the impossibility of rotation, and the dragging of the leg in walking. Fracture of the body is always accompanied by displacement, and as a consequence a shortening of the leg, which is carried forward. The lameness is excessive, the foot being moved, both when raising it from the ground and when setting it down, very timidly and cautiously. The manipulations for the discovery of crepitation always cause much pain. Lesions of the lower end of the bone are more difficult to diagnosticate with certainty, though the manifestation of pain while making heavy pressure upon the condyles will be so marked that only crepitation will be needed to turn a suspicion into a certainty.

The question as to treatment in fractures of this description resolves itself into the query whether any treatment can be suggested that can avail anything practically as a curative measure, whether, upon the hypothesis of reduction as an accomplished fact, any permanent or efficient device as a means of retention is within the scope of human ingenuity. If the reduction were successfully performed would it be possible to keep the parts in place by any known means at our disposal? At the best the most favorable result that could be anticipated would be a reunion of the fragments, with a considerable shortening of the bone, and a helpless, limping, crippled animal to remind us that for human achievement there is a "thus far, and no farther."

In small animals, however, attempts at treatment are justifiable, and we are convinced that in many cases of difficulty in the application of splints

and bandages a patient may be placed in a condition of undisturbed quiet and left to the processes of nature for "treatment" as safely and with as good an assurance of a favorable result as if he had been subjected to the most heroic *secundum artem* doctoring known to science. As a case in point, we may mention the case of a pregnant bitch which suffered a fracture of the upper end of the femur by being run over by a light wagon. Her "treatment" consisted in being tied up in a large box and let alone. In due time she was delivered of a family of puppies, and in three weeks she was running in the streets, limping very slightly, and nothing the worse for her accident.

Fracture of the patella.—This, fortunately, is a rare accident and can only result from direct violence, as a kick or other blow. The lameness which follows it is accompanied with enormous tumefaction of the joint and disease of the articulation. The prognosis is unavoidably adverse, destruction being the only termination of an incurable and very painful injury.

Fractures of the tibia are probably more frequently encountered than any others among the class of accidents we are considering. As with injuries of the forearm of a like character, they may be complete or incomplete; the former when the bone is broken in the middle or at the extremities, and transverse, oblique, or longitudinal. The incomplete kind are more common in this bone than in any other.

Complete fractures are easy to recognize, either with or without displacement. The animal is very lame, and the leg is either dragged or held up clear from the ground by flexion at the stifle, while the lower part hangs down. Carrying weight or moving backwards is impossible. There is excessive mobility below the fracture and well-marked crepitation. If there is much displacement, as in an oblique fracture, there will be considerable shortening of the leg.

While incomplete fractures can not be recognized in the tibia with any greater degree of certainty than in any other bone, there are some facts associated with them by which a diagnosis may be justified. The hypothetical history of a case may serve as an illustration:

An animal has received an injury by a blow or a kick on the inside of the bone, perhaps without showing any mark. Becoming very lame immediately afterwards, he is allowed a few days' rest. Being then taken out again, he seems to have recovered his soundness, but within a day or two he betrays a little soreness, and this increasing he becomes very lame again, to be furloughed once more, with the result of a temporary improvement, and again a return to labor and again a relapse of the lameness; and this alternation seems to be the rule. The leg being now carefully examined, a local periostitis is readily discovered at the point of the injury, the part being warm, swollen, and painful. What further proof is necessary? Is it not evident that a fracture has occurred, first superficial—a mere split in the bony structure which, fortunately, has been discovered before some extra exertion

or a casual misstep had developed it into one of the complete kind, possibly with complications? What other inference can such a series of symptoms thus repeated establish?

The prognosis of fracture of the tibia must, as a rule, be unfavorable. The difficulty of obtaining a union without shortening and consequently without lameness, is proof of the futility of ordinary attempts at treatment. But though this may be true in respect to fractures of the complete kind, it is not necessarily so with the incomplete variety, and with this class the simple treatment of the slings is all that is necessary to secure consolidation. A few weeks of this confinement will be sufficient.

With dogs and other small animals there are cases which may be successfully treated. If the necessary dressings can be successfully applied and retained, a cure will follow.

Fractures of the hock.—Injuries of the astragalus have been recorded which had a fatal termination. Fractures of the os calcis have also been observed, but never with a favorable prognosis, and attempts to induce recovery have, as might have been anticipated, proved futile.

Fractures of the cannon bones.—Whether these occur in the fore or hind legs they appear either in the body or near their extremities. If in the body, as a rule the three metacarpal or metatarsal are also affected, and the fracture is generally transverse and oblique, and often compound, one of the segments protruding sharply through the skin. Having only the skin for a covering the diagnosis is easy. There is no displacement, but excessive mobility, crepitation, inability to sustain weight, and the leg is kept off the ground by the flexion of the upper joint.

No region of the body affords better facilities for the application of treatment, and the prognosis is, on this account, usually favorable. We recall a case, however, which proved fatal, though under exceptional circumstances. The patient was a valuable stallion of highly nervous organization, with a compound fracture of one of the cannon bones, and his unconquerable resistance to treatment, excited by the intense pain of the wound, precluded all chance of recovery, and ultimately caused his death from nervous fever.

The general form of treatment for these lesions will not differ from that which has been already indicated for other fractures. Reduction, sometimes necessitating the casting of the patient; coaptation, comparatively easy by reason of the subcutaneous situation of the bone; retention, by means of splints and bandages—applied on both sides of the region, and reaching to the ground as in fractures of the forearm—these are always indicated. We have obtained excellent results by the use of a mold of thick gutta percha, composed of two sections and made to surround the entire lower part of the leg as in an inflexible case.

Fracture of the first phalanx.—The hinder extremity is more liable

than the fore to this injury. It is usually the result of a violent effort, or of a sudden misstep or twisting of the leg, and may be transverse, or, as has usually been the case in our experience, longitudinal, extending from the upper articular surface down to the center of the bone, and generally oblique and often comminuted. The symptoms are the swelling and tenderness of the region, possibly crepitation; a certain abnormal mobility; an excessive degree of lameness, and in some instances a dropping back of the fetlock, with perhaps a straightened or upright condition of the pastern.

The difficulty of reduction and coaptation in this accident, and the probability of bony deposits, as of ringbones, resulting in lameness, are circumstances which tend to discourage a favorable prognosis.

The treatment is that which has been recommended for all fractures, as far as it can be applied. The iron splint which has been mentioned gives excellent results in many instances, but if the fracture is incomplete and without displacement a form of treatment less energetic and severe should be attempted. One case is within our knowledge in which the owner of an injured horse lost his property by his refusal to subject the animal to treatment, the *post mortem* revealing only a simple fracture with very slight displacement.

Fractures of the coronet.—Though these are generally of the comminuted kind, there are often conditions associated with them which justify the surgeon in attempting their treatment. Though crepitation is not always easy to detect, the excessive lameness, the soreness on pressure, the inability to carry weight, the difficulty experienced in raising the foot, all these suggest, as the solution of the question of diagnosis, the fracture of the coronet, with the accompanying realization of the fact that there is yet, by reason of the situation of the member, immobilized as it is by its structure and its surroundings, room left for a not unfavorable prognosis. Only a slight manipulation will be needed in the treatment of this lesion. To render the immobility of the region more fixed, to support the bones in their position by bandaging, and to establish forced immobility of the entire body with the slings is usually all that is required. Ringbone, being a common sequela of the reparative process, must receive due attention subsequently. One of the severest complications likely to be encountered is anchylosis.

Fractures of the os pedis.—Though these lesions are not of very rare occurrence their recognition is not easy, and there is more of speculation than of certainty pertaining to their diagnosis. The animal is very lame, and, as much as possible, spares the injured foot, sometimes resting it upon the toe alone and sometimes not at all. The foot is very tender, and the exploring pincers of the examining surgeon causes much pain. There is nothing to encourage a favorable prognosis, and a not unusual termination is an anchylosis with either the navicular bone or the coronet.

No method of treatment needs to be suggested here, the hoof per-

forming the office of retention unaided. Local treatment by baths and fomentations will do the rest. It may be months before there is any mitigation of the lameness.

Fracture of the sesamoid bones.—This lesion has been considered by veterinarians, erroneously, we think, one of rare occurrence. We believe it to be more frequent than has been supposed. Many observations and careful dissections have convinced us that fractures of these little bones have often been mistaken for specific lesions of the numerous ligaments that are implanted upon their superior and inferior parts, and which have been described as a "giving way" or "breaking down" of these ligaments. In our *post mortem* examinations we have always noted the fact that when the attachments of the ligaments were torn from their bony connections minute fragments of bony structure were also separated, though we have failed to detect any diseased process of the fibrous tissue composing the ligamentous substance.

From whatever cause this lesion may arise, it can hardly be considered as of a traumatic nature, no external violence having any apparent agency in producing it, and it is our belief that it is due to a peculiar degeneration or softening of the bones themselves, a theory which acquires plausibility from the consideration of the spongy consistency of the sesamoids. The disease is a peculiar one, and the suddenness with which different feet are successively attacked, at short intervals and without any obvious cause, seems to prove the existence of some latent morbid cause which has been unsuspectedly incubating. It is not peculiar to any particular class of horses, nor to any special season of the year, having fallen under our observation in each of the four seasons. The general fact is reported in the history of a majority of cases that it makes its appearance without premonition in animals which, after enjoying a considerable period of rest, are first exercised or put to work, though in point of fact it may manifest itself while the horse is still idle in his stable. A hypothetical case, in illustration, will explain our theory:

An animal which has been at rest in his stable is taken out to work and it will be presently noticed that there is something unusual in his movement. His gait is changed, and he travels with short, mincing steps, without any of his accustomed ease and freedom. This may continue until his return to the stable, and then, after being placed in his stall, he will be noticed shifting his weight from side to side and from one leg to another, continuing the movement until rupture of the bony structure takes place. But it may happen that the lameness in one or more of the extremities, anterior or posterior, suddenly increases, and it becomes evident that the rupture has taken place in consequence of a misstep or a stumble while the horse is at work. Then, upon coming to a standstill, he will be found with one or more of his toes turned up—he is unable to place the affected foot flat on the ground. The fetlock has dropped and the leg rests upon this part, the skin of which may have

remained intact or may have been more or less extensively lacerated. It seldom happens that more than one toe at a time will turn up, yet still the lesion in one will be followed by its occurrence in another. Commonly two feet of a biped, the anterior or posterior, are affected, and we recall one case in which the two fore and one of the hind legs were included at the same time. The accident, however, is quite as likely to happen while the horse is at rest in his stall, and he may be found in the morning standing on his fetlocks. One of the earliest of the cases occurring in our own experience had been under our care for several weeks for suspected disease of the fetlocks, the nature of which had not been made out, when, apparently improved by the treatment which he had undergone, the patient was taken out of the stable to be walked a short distance into the country, but had little more than started when he was called to a halt by the fracture of the sesamoids of both fore legs.

While there are no positive premonitory symptoms known of these fractures we believe that there are signs and symptoms which come but little short of being so, and the appearance of which will always justify a strong suspicion of the truth of the case. These have been indicated when referring to the soreness in standing, the short "mincing" gait, and the tenderness betrayed when pressure is made over the sesamoids on the sides of the fetlock, with others less tangible and definable.

These injuries can never be accounted less than serious, and in our judgment will never be other than fatal. If our theory of their pathology is the correct one, and the cause of the lesions is truly the softening of the sesamoidal bony structure and independent of any changes in the ligamentous fibers, the possibility of a solid osseous union can hardly be considered admissible.

In respect to the treatment to be recommended and instituted it can only be employed with any rational hope of benefit during the incubation, and with the anticipatory purpose of prevention. It must be suggested by a suspicion of the verities of the case, and applied before any rupture has taken place. To prevent this and to antagonize the causes which might precipitate the final catastrophe—the elevation of the toes—resort must be had to the slings and to the application of firm bandages or splints, perhaps of plaster of Paris, with a high shoe, as about the only indications which science and nature are able to offer. When the fracture is an occurred event, and the toes, one or more, are turned up, any further resort to treatment will be futile.

DISEASES OF JOINTS.

Three classes of injury will be considered under this head. These are, affections of the synovial sac; those of the joint structures, or of the bones and their articular surfaces, and those forms of solution of continuity known as dislocations or luxations.

Diseases of the synovial sacs.—Two forms of affection here present themselves, one being the result of an abnornal secretion which induces a dropsical condition of the sac without any acute inflammatory action, while the other is characterized by excessive inflammatory symptoms, with their modifications, constituting synovitis.

Synovial dropsies.—We have already considered in a general way the presence of these peculiar oil bags in the joints, and in some regions of the legs where the passage of the tendons takes place, and have noticed the similarity of structure and function of both the articular and the tendinous bursæ, as well as the etiology of their injuries and their pathological history, and we now propose to treat of the affections of both.

Windgalls.—This name is given to the dilated bursæ found at the posterior part of the fetlock joint. They have their origin in a dropsical condition of the bursæ of the joint itself, and also of the tendon which slides behind it, and are therefore further known by the designations of *articular* and *tendinous.*

They appear in the form of soft and somewhat symmetrical tumors, of varying dimensions, and generally well defined in their circumference. They are more or less tense, according to the amount of secretion they contain, apparently becoming softer as the foot is raised and the fetlock flexed. Usually they are painless and only cause lameness under certain conditions, as when they began to develop themselves under the stimulus of inflammatory action, or when large enough to interfere with the functions of the tendons, or again when they have undergone certain pathological changes, such as calcification, which is among their tendencies.

Windgalls may be attributed to external causes, such as severe labor or strains resulting from heavy pulling, fast driving, or jumping, or they may be among the sequelæ of internal disorders and appear as resultants of a pleuritic or pneumonic attack.

An unnecessary amount of anxiety is sometimes experienced respecting these growths, with much questioning touching the expediency of their removal, all of which might be spared, for while they constitute a blemish their unsightliness will not hinder the usefulness of the animal, and in any case they rarely fail to show themselves easily amenable to treatment.

When in their acute stage, and when the dropsical condition is not excessive, pressure by bandages, slight alcoholic frictions, sweating, the use of liniments, or perhaps a stiff blister of the ordinary kind will accomplish all that will be desired. It will subdue the inflammation and abate the soreness, and perhaps if the animal is not too soon returned to labor and exposed to the same causes by which they were before induced, the excess of secretion will be absorbed and the walls of the sac strengthened, and the windgall will disappear.

But if the inflammation has become chronic, and the enlargement has been of considerable duration, the negative course will be the wiser one,

If any benefit results from treatment it will be of only a transient kind, the dilatation returning when the patient is again subjected to labor, and it will be a fortunate circumstance if inflammation has not supervened.

But notwithstanding the generally benignant nature of the tumor there are exceptional cases, usually when it is probably undergoing certain pathological changes, which may result in lameness and disable the animal, in which case surgical treatment will be indicated, especially if repeated blisters have failed to improve the symptoms. Firing is then a preëminent suggestion, and many a useful life has received a new lease as the result of this operation timely performed. The operation, which consists in emptying the sac by means of punctures through and through, made with a red-hot needle or wire, and the subsequent injection into the cavity of certain irritating and alterative compounds, designed to effect its closure by exciting adhesive inflammation, such as tincture of iodine, may be commended; but they are all too active and energetic in their effects and require too much special attention and intelligent management to be trusted to any hands other than those of an expert veterinarian.

Blood spavin and thoroughpins.—The complicated arrangement of the hock joint, and the powerful tendons which pass on the posterior part, are lubricated with the product of secretion from one tendinous synovial and several articular synovial sacs. One large articular sac contributes to the lubrication of the shank bone (the tibia) and the bones of the hock proper (the astragalus). The tendinous sac lies back of the articulation itself and extends upwards and downwards in the groove of that joint through which the flexor tendons slide. The dilatation of this articular synovial sac is what is denominated blood spavin, the term thoroughpin being applied to the dilatation of the tendinous capsule.

The blood spavin is situated in front and a little inward of the hock; the thoroughpin is found at the back and on the top of the hock. The former is round, smooth, well defined, presenting on its outer surface, running from below upwards, a vein which is more or less prominent as the bursa is more or less dilated, and it is from this conspicuous blood vessel that the tumor derives its name. The thoroughpin is also round and smooth, but not so regularly formed, on each side and a little in front of the tendons in that part of the hock known as the "hollows," immediately back of the posterior face of the tibia or shank bone.

In their general characteristics these tumors are similar to windgalls, and one description of the origin, symptoms, pathological changes, and treatment will serve for all equally, except that it is possible for a blood spavin to cause lameness, and thus to involve a verdict of unsoundness in the patient, a circumstance which will of course justify its classification by itself as a severer form of a single type of disease.

We have already referred to the subject of treatment and the means employed—*rest*, of course—with liniments, blisters, etc., and what we

esteem as the most active and beneficial of any, *early, deep, and well-performed cauterization.* There are, besides, commendatory reports of a form of treatment by the application of pads and peculiar bandages upon the hocks, and it is claimed that the removal of the tumors has been affected by their use. But our experience with this apparatus has not been accompanied by such favorable results as would justify our indorsement of the flattering representations which have sometimes appeared in its behalf.

Open joints—Broken knees—Synovitis—Arthritis.—The nearness of the relations which exist between these several affections and their apparent connection as perhaps successive developments of a similar if not an essentially identical origin, with the advantage to be gained by the avoidance of frequent repetition in the details of symptoms, treatment, etc., are our reasons for treating under a single head the ailments we have grouped together in the present chapter.

The great, comprehensive, common cause whose effect is the disability, sometimes permanent and sometimes only of transient duration, of chiefly the horse among our domestic animals, is external traumatism. Blows, bruises, hurts by nearly every known form of violence, falls, kicks, lacerations, punctures—we may add compulsory speed in racing and cruel overloading of draught animals—cover the entire ground of the diseases and injuries of the joints, now receiving our consideration.

In one case, a working horse making a misstep stumbles, and falling on his knees receives a hurt, variously severe, from a mere abrasion of the skin to a laceration, a division of the tegument, a slough, mortification, and the escape of the synovial fluid with or without exposure of the bones and their articular cartilages.

In another case an animal, from one cause or another, perhaps an impatient temper, has formed the habit of striking or pawing his manger with his fore feet until inflammation of the knee-joint is induced, first as a little swelling, diffused, painless; then as a periostitis of the bones of the knee; later as bony deposits, then lameness, and finally the implication of the joint, and following all the various conditions of *carpitis.*

In another case a horse has received a blow with a fork from a careless hostler, on or near a joint, or has been kicked by a stable companion, with the result of a punctured wound, at first mild-looking, painless, apparently without inflammation, and not yet causing lameness, but which, in a few hours, or it may be not until a few days, becomes excessively painful, grows worse; the entire joint swells, presently discharges, and at last a case of *suppurative synovitis* is presented, with perhaps disease of the joint proper, and *arthritis* as a climax. The symptoms of articular injuries vary not only in the degrees of the hurt, but in the nature of the lesion.

Or, the condition of *broken knees*, resulting as we have said, may have for its starting point a mere abrasion of the skin—a scratch apparently, which disappears without a resulting scar. The injury may, however,

have been more severe, the blow heavier, the fall aggravated by occurring upon an irregular surface, or sharp or rough object, with tearing or cutting of the skin, and this laceration may remain. A more serious case than the first is now brought to our notice.

Another time, immediately following the accident, or possibly as a sequel of the traumation, the tendinous sacs may be opened, with the escape of the synovia; or worse, the tendons which pass in front of the knee are torn, the inflammation has spread, the joint and leg are swollen, the animal is becoming very lame; *synovitis* has set in. With this the danger becomes very great, for soon suppuration will be established, the external coat of the articulation proper become ulcerated, if it is not already in that state, and we find ourselves in the presence of an *open joint*, with *suppurative synovitis*—that is, with the worst among the conditions of diseased processes, because of the liability of the suppuration to become infiltrated into every part of the joint, macerating the ligaments and irritating the cartilages, soon to be succeeded by their ulceration, with the destruction of the articular surface, or the lesion of *ulcerative arthritis*, one of the gravest among all the disorders known to the animal economy.

But ulcerative arthritis and suppurative synovitis may be developed in other connections than that with open joints; the simplest and apparently most harmless punctures may prove to be cause sufficient. For example, a horse may be kicked, perhaps, on the inside of the hock; there is a mark and a few drops of blood to indicate the spot; he is put to work, apparently free from pain or lameness, and performs his task with his usual ease and facility. But on the following morning the hock is found to be a little swollen and there is some stiffness. A little later on he betrays a degree of uneasiness in the leg, and shrinks from resting his weight upon it, moving it up and down for relief. The swelling has increased and is increasing; the pain is severe, and, finally, there is an oozing at the spot where the kick impinged of an oily liquid mixed with whitish drops of suppuration. The mischief is done and a simple, harmless punctured wound has expanded into a case of ulcerative arthritis and suppurative synovitis.

From ever so brief and succinct description of this traumatism of the articulations, the serious and important character of these lesions, irrespective of which particular joint is affected, will be readily understood. Yet there will be modifications in the prognosis in different cases, in accordance with the peculiarities of structure in the joint specially involved, as for example, it is obvious that a better result may be expected from treatment when but a single joint, with only its plain articular surfaces is the place of injury, than in one which is composed of several bones, united in a complex formation, as in the knee or hock. As severe a lesion as suppurative synovitis always is, and as frequently fatal as it proves to be, still cases arise in which the inflammation, assuming a modified character and at length subsiding, the lesion termi-

nates favorably and leaves the animal with a comparatively sound and useful joint. There are cases, however, which terminate in no more favorable a result than the union of the bones and occlusion of the joint, to form an anchylosis, which is scarcely a condition to justify a high degree of satisfaction, since it insures a permanent lameness with very little capacity for usefulness.

Appreciating now the dangers associated with all wounds of articulations, however simple and apparently slight, and how serious and troublesome are the complications which are likely to arise during their progress and treatment, we are prepared to understand and realize the necessity and the value of early and prompt attention upon their discovery and diagnosis.

For simple bruises, like those which appear in the form of broken knees, or of carpitis, simple remedies, such as warm fomentations or cold water applications and compresses of astringent mixtures, suggest themselves at once. Injuries of a more complicated character, as lacerations of the skin or tearing of soft structures, will also be benefited by simple dressings with antiseptic mixtures, as those of the carbolic acid order. The escape of synovia should suggest the prompt use of collodion dressings to check the flow and prevent the further escape of the fluid. But if the discharge is abundant and heavily suppurative, little can be done more than to put in practice the "expectant" method with warm fomentations, repeatedly applied, and soothing mucilaginous poultices. Improvement, if any is possible, will be but slow to manifest itself. The most difficult of all things to do, in view of varying interests and opinions—that is, in a practical sense—is to abstain from "doing" entirely, and yet we are firmly convinced that non-interfernce, in the cases we are considering, is the best and wisest policy.

In cases which are carried to a successful result the discharge will by degrees diminish, the extreme pain will gradually subside and the convalescent will begin timidly to rest his foot upon the ground, and presently to bear weight upon it, and perhaps, after a long and tedious process of recuperation, he may be returned to his former and normal condition of usefulness. When the discharge has wholly ceased and the wounds are entirely healed, a blister covering the whole of the joint for the purpose of stimulating the absorption of the exudation will be of great service. But if, on the contrary, there is no amelioration of symptoms and the progress of the disease resists every attempt to check it; if the discharge continues to flow, not only without abatement, but in an increased volume, and not alone by a single opening but by a number of fistulous tracts which have successively formed; if it seems evident that this drainage is rapidly and painfully sapping the suffering animal's vitality, and a deficient *vis vitæ* fails to coöperate with the means of cure, all rational hope of recovery may be finally abandoned. Any further waiting for chances, or time lost in experimenting, will be mere cruelty and there need be no hesitation concerning the next step. The

poor beast is under sentence of death, and every consideration of interest and of humanity demands an anticipation of nature's evident intent in the quick and easy execution of the sentence.

One of the essentials of treatment, and probably an indispensable condition when recovery is in any wise attainable, is the suspension of the patient in slings. He should be continued in them as long as he can be made to submit quietly to their restraint.

Luxations.—Strength and solidity are so combined in the formation of the joints of our large animals that dislocations or luxations are injuries which are but rarely encountered. They are met with but seldom in cattle and less so in horses, while dogs and smaller animals are more often the sufferers.

The accident of a luxation or (its synonym) dislocation (*displacement*) is less often encountered in the animal races than in man. This is not because the former are less subject to occasional violence involving powerful muscular contractions, or are less often exposed to casualties similar to those which result in luxations in the human skeleton, but because it requires the coöperation of conditions, anatomical, physiological, and perhaps mechanical, present in one of the races and lacking in the other, but which can not in every case be clearly defined. Perhaps the greater relative length of the bony levers in the human formation may constitute a cause of the difference.

Among the predisposing causes in animals, caries of articular surfaces, articular abscesses, excessive dropsical conditions, degenerative softening of the ligaments, and any excessive laxity of the soft structures, may be enumerated.

The symptoms of fractures and of dislocations are not always so variant as to preclude the possibility of error in determining a case without a thorough examination, but the essential difference, as it must always exist, must always be discoverable.

In a dislocation there is one very peculiar and characteristic feature in the impossibility of motion associated with an excessive liberty of movement—the impossibility of active or controlled motion, and a facility of passive movement (or movableness) at either the affected joint or at another of the same leg near to it. In a dislocation of the scapulo-humeral (or shoulder) joint the animal possesses no power of motion over the limb—no muscular contraction can avail to cause it to perform its various functions—but in the hands of the surgeon it may be made to describe a series of movements which would be simply impossible with the joint in a state of integrity. Both fractures and luxations are marked by deformity, but while in a fracture with displacement there will usually be a shortening of the leg, a dislocation may be accompanied by either a shortening or a lengthening. Swelling of the parts is usually a well-defined feature of these injuries.

With all this similarity in the symptomatology of luxations and fractures, there is one sign which either by its presence or its absence

will greatly assist in settling a case of differential diagnosis, and this is the existence or lack of *crepitation*. It has no place or cause in a mere dislocation; it belongs to a fracture, if it is a complete one. If there is crepitation with a dislocation then it proves that there is a fracture also.

The prognosis of a luxation is comparatively less serious than that of a fracture, though at times the indications of treatment may prove to be so difficult to apply that complications may arise of a very severe character.

The treatment of luxations must of course be similar to that of fractures. Reduction, naturally, will be the first indication in both cases, and the retention of the replaced parts must follow. The reduction involves the same steps of extension and counter-extension, performed in the same manner, with the patient subdued by anesthetics.

The difference between the reduction of a dislocation and that of a fracture consists in the fact that in the former the object is simply to restore the bones to their true normal position, with each articular surface in exact contact with its companion surface, the apparatus necessary afterwards to keep them *in situ* being similar to that which is employed in fracture cases, and which will usually require to be retained for a period of from forty to fifty days, if not longer, before the ruptured retaining ligaments are sufficiently firm to be trusted to perform their office unassisted. A variety of manipulations are to be employed by the surgeon, consisting in pushing, pulling, pressing, rotating, and indeed whatever movement may be necessary, until the bones are forced into such relative positions that the muscular contraction, operating in just the right directions, pulls the opposite matched ends together in true coaptation, a head into a cavity, an articular eminence into a trochlea, as the case may be. The "setting" is accompanied by a peculiar snapping sound, audible and significant, as well as a visible return of the surface to its normal symmetry.

Special dislocations.—While all the articulations of the body are liable to this form of injury, there are three in the large animals which may claim a special consideration, viz:

The shoulder joint.—We mention this displacement without intending to imply the practicability of any ordinary attempt at treatment, which is usually unsuccessful, the animal whose mishap it has been to become a victim to it being disabled for life. The superior head of the arm bone as it is received into the lower cavity of the shoulder blade is so situated as to be liable to be forced out of place in four directions. It may escape from its socket, according to the manner in which the violence affects it, outwards, inwards, backwards, or forwards, and the deformity which results and the effects which follow will correspondingly differ. We have said that treatment is generally unsuccessful. It may be added that the difficulties which interpose in the way of reduction are nearly insurmountable, and that the application of means

for the retention of the parts after reduction would be next to impossible. The prognosis is sufficiently grave from any point of view for the luckless animal with a dislocated shoulder.

The hip joint.—This joint partakes very much of the characteristics of the humero-scapular articulation, but is more strongly built. The head of the thigh bone is more separated, or prominent and rounder in form, and the cup-like cavity or socket into which it fits is much deeper, forming together a deep, true ball-and-socket joint, which is, moreover, reënforced by two strong cords of funicular ligaments, which unite them together. It will be easily comprehended, from this hint of the anatomy of the region, that a luxation of the hip joint must be an accident of comparatively rare occurrence. And yet cases are recorded in which the head of the bone has been affirmed to slip out of its cavity and assume various positions, inwards, outwards, forwards, and backwards.

The indications of treatment are those of all cases of dislocation. When the reduction is accomplished the surgeon will be apprised of the fact by the peculiar snapping sound usually heard on such occasions.

Pseudo luxations of the patella.—This is not a true dislocation. The stifle bone is so peculiarly articulated with the thigh bone that the means of union are of sufficient strength to resist the causes which usually give rise to luxations. Yet there is sometimes discovered a peculiar pathological state in the hind legs of animals, the effect of which is closely to simulate the manifestation of many of the general symptoms of dislocations. This peculiar pathological condition originates in muscular cramps, the action of which is seen in a certain change in the coaptation of the articular surfaces of the stifle and thigh bone, resulting in the exhibition of a sudden and alarming series of symptoms which have suggested the phrase of "stifle out" as a descriptive term. The animal so affected stands quietly and firmly in his stall, or perhaps with one of his hind legs extended backwards, and resists every attempt to move him backwards, and if urged to move forwards he will either refuse or comply with a jump, with the toe of the disabled leg dragging on the ground and brought forward by a second effort. There is no flexion at the hock and no motion at the stifle, while the circular motion of the hip is quite free. The leg appears to be much longer than the other, owing to the straightened position of the thigh bone, which forms almost a straight line with the tibia from the hip joint down. The stifle joint is motionless, and the motions of all the joints below it are more or less interfered with. External examination of the muscles of the hip and thigh discovers a certain amount of rigidity, with perhaps some soreness, and the stifle bone may be seen projecting more or less on the outside and upper part of the joint.

This state of things may continue for some length of time and until treatment is applied, or it may spontaneously and suddenly terminate, leaving everything in its normal condition, but perhaps to return again.

Pseudo dislocation of the patella is likely to occur under many of

the conditions which cause actual dislocation, and yet it may often occur in animals which have not been exposed to the ordinary causes, but which have remained at rest in their stables. Sometimes these cases are referred to falls in a slippery stall, or perhaps slipping when endeavoring to rise; sometimes to weakness in convalescing patients; sometimes to lack of tonicity of structure and general debility; sometimes to relaxation of tissues from want of exercise or use.

The reduction of these displacements of the patella is not usually attended with difficulty. A sudden jerk or spasmodic action will often be all that is required to spring the patella into place, when the flexion of the leg at the hock ends the trouble for the time. But this is not always sufficient, and a true reduction may still be indicated. To effect this the leg must be drawn well forward by a rope attached to the lower end, and the patella, grasped with the hand, forcibly pushed forwards and inwards and made to slip over the outside border of the trochlea of the femur. The bone suddenly slips into position, the excessive rigor of the leg ceases with a spasmodic jerk, and the animal may walk or trot away without suspicion of lameness. But though this may end the trouble for the time, and the restoration seem to be perfect and permanent, a repetition of the entire transaction may subsequently take place, and perhaps from the loss of some portion of tensile power which would naturally follow the original attack in the muscles involved, the lesion might become a habitual weakness.

Warm fomentations and douches with cold water will often promote permanent recovery, and liberty in a box stall or in the field will in many cases insure constant relief. The use of a high-heeled shoe is recommended by European veterinarians. The use of stimulating liniments, with frictions, charges or even severe blisters, may be resorted to in order to prevent the repetition of the difficulty by strengthening and toning up the parts.

DISEASES OF MUSCLES AND TENDONS.

Sprains.—This term expresses a more or less complete laceration or yielding of the fibers of the muscles, tendons, or the sheaths surrounding and supporting them. The usual cause of a sprain is external violence, such as a fall or a powerful exertion of strength, with following symptoms of soreness, heat, swelling, and a suspension of function. Their termination varies from simple resolution to suppuration, and commonly plastic exudation difficult to remove. None of the muscles or tendons of the body are exempt from liability to this lesion, though naturally from their uses and the exposure of their situation the extremities are more liable than other regions to become their seat. The nature of the prognosis will be determined by a consideration of the seat of the injury and the complications likely to arise. The treatment will resolve itself into the routine of local applications, including warm fomentations, stimulating liniments, counter irritation by blistering,

and in some cases even firing. Rest, in the stable or in a box stall, will be of advantage by promoting the absorption of whatever plastic exudation may have formed, or the absorption may be stimulated by the careful and persevering application of iodine in the form of ointments of various degrees of strength.

There are many conditions in which not only the muscular and tendinous structures proper are affected by a sprain, but, by contiguity of parts, the periosteum of neighboring bones may become involved, with a complication of periostitis and its sequelæ.

Lameness of the shoulder.—The frequency of the occurrence of lameness in the shoulder from sprains entitled it to precedence of mention in our present category. For, though so well covered with its muscular envelope, it is often the seat of injuries which, from the complex structure of the region, become difficult to diagnosticate with satisfactory precision and facility. The flat bone which forms the skeleton of that region is articulated in a comparatively loose manner with the bone of the arm, but the joint is, notwithstanding, rather solid, and is powerfully strengthened by tendons passing outside, inside, and in front of it. Still, shoulder lameness or sprain may exist, originating in lacerations of the mucles, the tendons or the ligaments of the joint, or perhaps in diseases of the bones themselves. "Slip of the shoulder" is a phrase frequently applied to such lesions.

The identification of the particular structures involved in these lesions is of much importance, in view of its bearing upon the question of prognosis. For example, while a simple superficial injury of the spinatus muscles, or of the muscles by which the leg is attached to the trunk, may not be of serious import and may readily yield to treatment, or even recover spontaneously and without interference, the condition is quite changed when a case of tearing of the flexor brachii, or of its tendons as they pass in front of the articulation occurs, or, what is still more serious, if there is inflammation or ulceration in the groove over which this tendon slides, or upon the articular surfaces or their surroundings or periostitis at any point adjacent.

The frequency of attacks of shoulder lameness is not difficult to account for. The superficial and unprotected position of the part, and the numerous movements of which it is capable, and which in fact it performs, render it both subjectively and objectively preëminently liable to accident or injury. It would be difficult, nor would it materially avail, to enumerate all the forms of violence by which the shoulder may be crippled. A fall, accompanied by powerful concussion; a violent muscular contraction in starting a heavily loaded vehicle from a standstill; a misstep following a quick muscular effort; a jump accompanied by miscalculated results in alighting; a slip on a smooth, icy road; balling the feet with snow; colliding with another horse or other object—indeed, the list might be indefinitely extended, but it would be without profit or utility. Some of the symptoms of shoulder lameness

are peculiar to themselves, and yet the trouble is frequently mistaken for other affections—navicular disease more often than any other. The fact that in both affections there are instances when the external symptoms are but imperfectly defined, and that one of them especially is very similar in both, is sufficient to mislead careless or inexperienced observers and to occasion the error which is sometimes committed of applying to one disease the name of the other, erring both ways in the interchange. The true designation of pathological lesions is very far, at times, from being of certain and easy accomplishment, and owing to the massive structure of the parts we are considering this is especially true in the present connection. And still there are many cases in which there is really no reasonable excuse for an error in diagnosis by an average practitioner.

Shoulder lameness will of course manifest itself by signs and appearances more or less distinct and pronounced, according to the nature of the degree and the extent of the originating cause. We summarize some of these signs and appearances:

The lameness is not intermittent but continued, the disturbance of motion gauging the severity of the lesion and its extent. It is more marked when the bones are diseased than when the muscles alone are affected. When in motion the two upper bony levers, the shoulder blade and the bone of the upper arm, are reduced to nearly complete immobility and the walking is performed by the complete displacement of the entire mass, which is dragged forward without either flexion or extension. The action of the joint below, as a natural consequence, is limited in its flexion. In many instances there is a certain amount of swelling at the point of injury—at the joint, or more commonly in front of it, or on the surface of the spinatus muscle. Again, instead of swelling there will be muscular atrophy, though while this condition of loss of muscular power may interfere with perfect locomotion, it is not in itself usually a cause of shoulder lameness. "Swenied" shoulders are more often due to disease below the fetlock than to affections above the elbow.

During rest the animal often carries his leg forward, somewhat analogous to the "pointing" position of navicular disease, though in some cases the painful member drops at the elbow in a semi-flexed position. The backing is sometimes typical, the animal when performing it, instead of flexing his shoulder, dragging the whole leg without motion in the upper segment of the extremity. The peculiar manner in which the leg is carried forward in the act of walking or trotting is in some instances characteristic of injuries of the shoulder, the power of extension being limited; the whole leg in the act of locomotion is moved forward with a circumflex, swinging motion, which distinguishes this peculiar affection from others.

With the utmost scrutiny and care the vagueness and uncertainty of the symptoms will contribute to perplex and discredit the diagnosis

and embarrass the surgeon, and sometimes the expedient is tried of aggravating the symptoms by way of intensifying their significance, and thus rendering them more intelligible. This has been sought by requiring the patient to travel on soft plowed ground and compelling him to turn on the affected leg as a pivot, with other motions calculated to betray the locality of the pain.

It is our conviction that lameness of the shoulder will in many cases disappear with no other prescription than that of *rest*. Provided the lesions occasioning it are not too severe time is all that is required. But the negation of *letting alone* is seldom accepted as a means of doing good, in the place of the active and the positive forms of treatment. This is in accordance with a trait of human nature which is universal, and is unlimited in its applications. Hence there must be *something* done. In mild cases of shoulder lameness, then, the indications are water, either in the cold douche or by showering, or by warm fomentations. Warm wet blankets are of great service; and in addition, or as alternative, anodyne liniments, camphor, belladonna, either in the form of tincture or the oils, are of benefit, and at a later period stimulating friction with suitable mixtures, sweating liniments, blistering compounds, etc., will find their place, and, finally, when necessity demands it, the firing iron and the seton.

The duration of the treatment must be determined by its effects and the evidence that may be offered of the results following the action of the reparative process. But the great essential condition of cure, and the one without which the possibility of relapse will always remain as a menace, is, as we have often reiterated in analogous cases, *rest*, imperatively rest, irrespective of any other prescriptions with which it may be associated.

Sprain of the elbow muscles.—This injury, which fortunately is not very common, is mostly encountered in cities, among heavy draught horses or rapidly driven animals which are obliged to travel, often smooth shod, upon slippery, icy, or greasy pavements, where they are easily liable to lose their foothold. The region of the strain is the posterior part of the shoulder, and the muscles which are affected are those which occupy the space between the posterior border of the scapula and the posterior face of the arm. It is the muscles of the olecranon which give way.

The symptoms are easily recognized, especially when the animal is in action. While at rest the attitude may be normal, or by close scrutiny a peculiarity may perhaps be detected. The leg may seem to drop; the elbow may appear to be lower than its fellow, with the knee and lower part of the leg flexed and the foot resting on the toe, with the heel raised. Such an attitude, however, may be occasionally assumed by an animal without having any special significance. But when it becomes more pronounced on putting him in motion the fact acquires a symptomatic value, and this is the case in the present instance. A

rapid gait becomes quite impossible, and the walk as in some few other diseases becomes sufficiently characteristic to warrant a diagnosis even when observed from a distance. An entire dropping of the anterior part of the trunk becomes manifest, and no weight is carried on the disabled side, in consequence of the loss of action in the suspensory muscles. There are often heat, pain, and swelling in the muscular mass at the elbow, though at times a hollow or depression may be observed near the posterior border of the scapula, which is probably the seat of injury.

These hurts are of various degrees of importance, varying from mere minor casualties of quick recovery to lesions which are of sufficient severity to render an animal useless and valueless for life.

The prime elements of treatment, which should be strictly observed, are rest and quiet. Prescriptions of all kinds, however, of course, have their advocates. Among them are ether, chloroform, camphor, alcoholic frictions, warm fomentations, blisters, setons, etc. But, unless the conclusions of experience are to be ignored, our own judgment is decisive in favor of rest, judiciously applied; and our view of what constitutes a judicious application of rest has been more than once presented in these pages. There are degrees of this rest. One contemplates simple immobility in a narrow stall. Another means the enforced mobility of the slings and a narrow stall as well. Another a box stall, with ample latitude as to posture and space, and option to stand up or lie down. As wide as this range may appear to be, radical recovery has occurred under all of these modified forms of *letting our patients alone.*

Hip lameness.—The etiology of injuries and diseases of the hip is one and the same with that of the shoulder. The same causes operate and the same results follow. The only essential change, with an important exception, which would be necessary in passing from one region to the other in a description of its anatomy, its physiology, and its pathology, would be a substitution of anatomical names in referring to certain bones, articulations, muscles, ligaments, and membranes concerned in the injuries and diseases described. It would be only a useless repetition to cover again the ground over which we have so recently passed in recital of the manner in which certain forms of external violence (falls, blows, kicks, etc.) result in other certain forms of lesion (luxation, fracture, periostitis, ostitis, etc.), and to recapitulate the items of treatment and the names of the medicaments proper to use. The same rules of diagnosis and the same indications and prognosis are applicable equally to every portion of the organism, with only such modifications in applying dressings and apparatus as may be required by differences of conformation and other minor circumstances, which must suggest themselves to the judgment of every experienced observer when the occasion arrives for its exercise.

There is an exception to be made, while considering the subject in connection with the region now under advisement, in respect to the for-

midable affection known as morbus coxarius, or hip-joint disease; and leaving the detail of other lesions to take their place under other heads, that relating to the shoulder, for instance, we turn to the hip joint and its ailments as the chief subject of our present consideration.

In investigating for morbus coxarius, let the observer first examine the lame animal by scanning critically the outlines of the joint and the region adjacent for any difference of size or disturbance of symmetry in the parts, any prominence or rotundity, and on both sides. The lame side will probably be warmer, more developed and fuller, both to the touch and to the eye. Let him then grasp the lower part of the leg (as he would in examining a case of shoulder lameness), and endeavor to produce excessive passive motion. This will probably cause pain when the leg is made to assume a given position. Let him push the thigh forcibly against the hip bone, and the contact will again probably cause a manifestation of pain. If the horse is trotted, the limited action of the hip joint proper and the excessive dropping and rising of the hip of the opposite side will be easily recognized. The abductive or circumflex motion observed in shoulder lameness is also present in hip lameness, but under special conditions, and the test of the difficulty, either by traveling on soft ground or making the lame leg a pivot in turning the horse in a circle, may here also contribute to the diagnosis as in testing for lameness in the anterior extremity.

The prognosis of hip lameness is at times quite serious, not only on account of the long duration of treatment required to effect good results, and because of the characters which may be assumed by the disease, but of the permanence of the disability resulting from it. Exostosis and ulcerative arthritis are sequelæ which often resist every form of treatment.

As before intimated, this is little more than a repetition of our remarks upon the lameness of the shoulder, with slight modifications occasioned by the muscular structure of the hip, and we are limited to the same recommendations of treatment. The advantages of rest must be reaffirmed with local applications, of which, however, it may be said that they are more distinctly indicated and likely to be more effective in their results than in shoulder lameness, and may be more freely employed, whether in the form of liniments, blisters (singly or repeated), firing, or setoning.

Sprains of suspensory ligaments and of the flexor tendons or their sheath.—The fibrous structure situated behind the cannon bones, both in the fore and hind legs, is often the seat of lacerations or sprains resulting from violent efforts or sudden jerks. The injury is readily recognized by the changed aspect of the region and the accompanying local symptoms. The parts, which in health are well defined, with the outlines of the tendons and ligaments well marked, become the seat of a swelling, more or less developed, from a small spot of the middle of the back of the tendon to a tumefaction reaching from the knee down to and even

involving the fetlock itself. It is always characterized by heat, and it is variously sensitive, ranging from a mere tenderness to a degree of soreness which shrinks from the lightest touch. The degrees of the lameness vary, and it has a corresponding range with the soreness, sometimes showing only a slight halting and at others the extreme of lameness on three legs, with intermediate degrees.

It has for its cause, like all the other forms, external traumatism by falls, blows, etc., and may be considered serious or trifling, according to the circumstances of each case as judged by its own history. It may be safely assumed on general principles that a leg which has received such injuries very seldom returns to a perfect condition of efficiency and soundness, and that as a fact a certain absolute amount of thickening and deformity will remain in permanency, even when the lameness has entirely disappeared.

For this reason the injured member should receive the earliest attention possible, not only when the inflammatory condition is present but when it is subsiding, and there is only the thickening of the ligaments, the tendons, or the sheath. Cold bathing, cold-water bandages, either simple or with astringent solutions, do well in some cases, while in others hot applications have the preference, with complete rest; also, moderate exercise; frictions with alcohol; tincture of soap; spirits of camphor; mild liniments; strong sweating liniments; blisters; the cautery—these are the means by which the absorption of the exudate must be promoted and the work of restoration effected. The preparations of iodine are often of benefit in mild cases, but there are others in which the thickening of the tendons refuses to yield and the changed tissues remain firmly organized, leaving them in the form of a thick mass resting on the back part of the cannon bone. As a consequence the deformity remains and a new condition presents itself in the articular disposition, constituting the deformity known as the *knuckling fetlock.*

By this is meant a deformity of the fetlock joint by which the natural angle is changed from that which pertains to the healthy articulation. The first pastern or suffraginis loses its oblique direction and assumes another which varies from the upright to the oblique, from before backwards, and from above downwards; in other words, forming an angle with its point in front.

This condition, as we have seen, may be the result of chronic disease producing structural changes in the tendons, and it may also occur as the result of other affections or some peculiarity independent of this and situated below the fetlock, such as ringbones, sidebones, or traumatic disease of the foot proper. Animals are sometimes predisposed to knuckling, such, for example, as are naturally straight in their pasterns or animals which are compelled to labor when too young. The hind legs are more predisposed than the fore to this deformity, in consequence of the greater amount of labor they are required to perform as the propelling levers of the body

The symptoms of knuckling are easily recognized. The changes in the direction of the bones vary more or less with the degree of the lesion, sometimes assuming such a direction that it almost becomes a true dislocation of the pastern.

The effect of knuckling upon the gait also varies according to the degree of the deformity. As the different degrees of the shortening of the leg affect the motion of the fetlock the lameness may be very slight or quite extreme. Another consequence of this shortening is such a change in the position of the foot that the heels cease to come in contact with the ground and assume a greater elevation, and the final result of this is soon witnessed in the development of a *clubfoot.*

To whatever cause the knuckling may be ascribed it is always a severe infirmity, and there is but little room for hoping to overcome it unless it be during the very first stages of the trouble, and the hope dwindles to still smaller dimensions when it is secondary to other diseases below the fetlock. If it is caused by overworking the animal, the first indication will of course be rest. The animal must be turned loose and left unemployed and careful attention given to the condition of his feet and to the manner of shoeing, while time is allowed for the tendons to become restored to their normal state and the irritation caused by excessive stretching has subsided. A shoe with a thick heel will contribute to this. But if no improvement can be obtained and the tendons though retracted have yet been relieved of much of their thickening, the case is not a desperate one and may yet be benefited by the operation of tenotomy, single or double—an operative expedient which must be committed to the experienced surgeon for its performance.

Sprung knees.—Though not positively the result of diseases of the tendons acting upon the knees, we venture to consider this deformity in connection with that which we have just described. It consists in such an alteration in the direction and articulation of the bones which form the various carpal joints that instead of forming a vertical line from the lower end of the forearm to the cannon bone they are so united that the knee is more or less bent forward, presenting a condition due to the retraction of two of the principal muscles by which the cannon bone is flexed.

This flexion of the knee may also be a congenital deformity and have continued from the foaling of the animal. Or, like clubfoot it may be the result of heavy labor which the animal has been compelled to perform at too early an age. It may also be due to other diseases existing in parts below the knee joint.

This change of direction largely influences the movement of the animal by detracting from its firmness and practically weakening the entire frame, even to the extent of rendering him insecure on his feet, and liable to fall. This condition of weakness is sometimes so pronounced that he is exposed to fall even when standing at rest and unmolested, the knees being unable even to bear the portion of the mere weight of

the frame which belongs to them. This results in another trouble, that of being unable to keep permanently upright. He is apt to fall on his knees, and by this act becomes presently a sufferer from the lesion known by the term of *broken knees*.

Whatever may be the originating cause of this imperfection it detracts very largely from the usefulness and value of a horse, disqualifying him for ordinary labor and wholly unfitting him for service under the saddle without jeopardizing the safety of his rider. If, however, the trouble is known from the start, and is not the result of congenital deformity or weakness of the knee joint, or secondary to other diseases, rest, with fortifying frictions, may sometimes aid in strengthening the joints; and the application of blisters on the posterior part of the knee, from a short distance above to a point a little below the joint, may be followed by some satisfactory results. But with this trouble, as with knuckling fetlocks, the danger of relapse must not be ignored, but kept in mind as a contingency always liable to occur.

Curb.—This lesion is the bulging backwards of the posterior part of the hock, where in the normal state there should be a straight line, extending from the upper end of the point of the hock down to the fetlock. The cause may be a sprain of the tendon which passes on the posterior part of the hock, or of one of its sheaths, or of the strong ligament situated on the posterior border of the *os calcis*. This condition, if not commonly the result of malformation, is often seen in hocks which present the peculiar condition of being curby. It often occurs, also, as the result of violent efforts, of heavy pulling, of high jumping or of slipping; in a word, it may result from any of the causes heretofore considered as instrumental in producing lacerations of muscular, tendinous, or ligamentous struture.

A hock affected with curb will, at the outset, present a swelling more or less diffuse on its posterior portion, with varying degrees of heat and soreness, and these will be accompanied by lameness of a permanent character. At a later period, however, the swelling will become better defined, the deformity more characteristic, the prominent curved line readily detected, and the thickness of the infiltrated tissue easily determined by the fingers. At this time, also, there may be a condition of lameness, varying in degree; while at others, again, the irregularity of action at the hock will be so slight as to escape attention, the animal betraying no appearance of its existence.

A curb constitutes, by a strict construction of the term, an "unsoundness," since the hock thus affected is less able to endure severe labor, and is more liable to give way with the slightest effort. And yet the prognosis of a curb can not be considered to be serious, since it generally yields to treatment, or at least the lameness it may occasion is generally easily relieved, though the loss of contour caused by the bulging will always constitute a blemish to the eye.

On the first appearance of a curb, when it exhibits the signs of an

acute inflammation, the first indication is to subdue this by the use of warm fomentations or other topical applications. But when these have exhausted their effect and the swelling has assumed better defined boundaries, and the infiltration of the tendons or of the ligaments is all that remains of a morbid state, then every effort must be directed to the object of effecting its absorption and reducing its dimensions by pressure and other methods. The medicaments most to be trusted are blisters of cantharides and frictions with ointments of iodine, or, preferably, biniodide of mercury. Mercurial agents alone, by their therapeutic properties, or by means of the artificial bandages which they furnish by their incrustations when their vesicatory effects are exhausted, will give good results in some instances by a single application, and often by repeated applications. The use of the firing iron must, however, be frequently resorted to, either to remove the lameness or to stimulate the exudation. We believe that its early application ought to be resorted to in preference to waiting until the exudation is firmly organized. Deep and fine needle firing will prove as beneficial in curb as in any other disease of a similar nature.

Lacerated tendons.—This form of injury, whether of a simple or of a compound character, may become a lesion of a very serious nature, and will usually require long and careful treatment, which may yet prove unavailing in consequence either of the intrinsically fatal character of the wound itself or the complications which have rendered it incurable.

Like all similar injuries, these are the result of traumatic violence, such as contact with objects both blunt and sharp; a curbstone in the city; in the country a tree stump or a fence, especially one of wire. It may easily occur to a runaway horse when he is "whipped" with fragments of harness or "flogged" by fragments of splintered shafts "thrashing" his legs, or by the contact of his legs with the wagon he has overturned and shattered with his heels while disengaging himself from its wreck.

It is not always necessary that the skin should be involved in this form of injury. On the contrary the tegument is frequently left entirely intact, or exhibits only some slight and superficial abrasions. Yet, again, the skin may be cut through and the tendons nearly severed. A point a little above the fetlock is usually the seat of the injury. But irrespective of this, and whether the skin is or is not implicated, the symptoms very much resemble those of a fracture. There is excessive mobility, at least more than in a normal state, with more or less inability to carry weight; there may be swelling of the parts, and on passing the hands carefully along the tendon to the point of division the stumps of the divided structure will be felt more or less separated, perhaps wholly divided. The position of the animal while at rest and standing is peculiar and characteristic. While the heels are well placed on the ground, the toe is correspondingly elevated with a disposition to turn

up—a form of breaking down which we have described when speaking of the fracture of the sesamoids. Carrying weight is done only with considerable difficulty, but with comparatively little pain, and the animal will unconsciously continue to move the leg as if in great suffering, notwithstanding the fact that his general condition may be very good and his appetite unimpaired.

The effect upon the general organism of compound lacerated wounds of tendinous structures, or those which are associated with injuries of the skin, are different. The wound becomes, in a short time, the seat of a high degree of inflammation with abundant suppuration, filling it from the bottom; and the tendon, whether as the result of the bruise or of the laceration, or of maceration in the accumulated pus, undergoing a process of softening, and necrosis and sloughing ensue. This complicates the case, and probably some form of tendinous synovitis follows, running into suppurative arthritis, to end, if close to a joint, with a fatal result.

The prognosis of lacerated tendons should be very cautiously attempted. Under the most favorable circumstances a period of from six weeks to two months will be necessary for the treatment, before the formation of the cicatricial callus and the establishment of a firm union between the tendinous stumps.

As with fractures, and even in a greater degree, the necessity is imperative, in the treatment of lacerated tendons, to secure as perfect a state of immobility as can be obtained compatibly with the disposition of the patient; the natural opposition of the animal, sometimes ill-tempered and fractious at best, under the necessary restraint, causing at times much embarrassment to the practitioner in applying the necessary treatment. Without the necessary immobility no close connection of the ends of the tendons can be secured. To fulfill this necessary condition the posterior part of the foot and the fetlock must be supported and the traction performed by them relieved, an object which can be attained by the use of the high-heeled and bar shoe, or possibly better accomplished with a shoe of the same kind extending about 2 or 2½ inches back of the heels. The perfect immobility of the legs is obtained in the same way as in the treatment of fracture, with splints, bandages, iron apparatus, plasters of adhesive mixtures, and similar means. So long as the dressings remain in place undisturbed, and no chafing or other evidence of pain are present, the dressings may be continued without changing, the patient being kept in the slings for a period sufficient to insure the perfect union of the tendons. But for a compound lesion, when there is laceration of the skin, some special care is necessary. The wound must be carefully watched and the dressings removed at intervals of a few days, or as often as may be needful, all of which additional manipulation and extra nursing, however indispensable, still adds to the gravity of the case and renders the prognosis more and more serious. When the tendons have sloughed

in threads of various dimensions, or if in the absence of this process of mortification healthy granulations should form and fill up the wound, still very careful attention will be required, the granulating ends of the tendons having a tendency to bulge between the edges of the skin and to assume large dimensions, forming bulky excrescences or growths of a warty or cauliflower appearance, the removal of which becomes a troublesome matter.

The union of the tendons will at times leave a thickening of varying degree near the point of cicatrization, the absorption of which becomes an object of difficult and doubtful accomplishment, but which may be promoted by moderate blistering and the use of alterative and absorbent mixtures or perhaps the fire iron. A shoe with heels somewhat higher than usual will prove a comfort to the animal and aid in moderating and relieving the tension of the tendons.

Rupture of the flexor metatarsi.—This is a muscle of the anterior part of the shank. It is situated in front of the tibia, and is of peculiar formation, being composed of a muscular portion with a very powerful tendon, which are at first distinct and separate, to be intimately united lower down, and terminating at the lower end by a division into four tendinous bands. It is a powerful muscle of the hinder shank bone, and also acts as a strong means of support for the stifle joint, that is, of the articulation of the thigh and shank bone, in front and outside of which it passes. Its situation and its use cause it to be liable to severe stretching and straining, and a rupture of some of its fibers is sometimes the consequence.

This may be the result of a violent effort of the animal in leaping over a high obstacle; in missing his foothold and suddenly slipping backwards while powerfully grasping the ground with the feet in striving to start a heavily loaded vehicle; or in making a violent effort to prevent a probable fall.

The accident is immediately followed by disability which will vary both as to the true seat of the injury and the period of its duration. This rupture will not prevent the horse from standing perfectly and firmly on his feet when kept at rest, and while no muscular efforts are required from him there is no appearance of any lesion or unsoundness. An attempt to move him backwards, however, will cause him to throw all his weight upon his hind quarters, and he will refuse to raise his foot from the ground. If compelled to do so, or required to move forward, the hock being no longer capable of flexion, the muscle which effects that movement being the injured one, the opposite muscles, the extensors, acting freely, the entire lower part of the leg, from the hock down, will be suddenly, with a jerk, extended over the tibia or shank bone, and simultaneously with this the tendo-achilles, the cord of the hock, the tendons of the extensors of the hock will be put in an excessively relaxed condition. Examination of the fore part of the shank from the stifle down to the hock may reveal soreness, and possibly some swelling and heat at the seat of the lesion.

Our experience with injuries of this form satisfies us that, generally speaking, they are amenable to treatment. Very few instances have come to our knowledge in which radical recovery has not been obtained, provided a sufficient time has been allowed for cicatrization to take place.

In these cases, as in those already considered of simple laceration of tendons, the indications resemble those which apply in the treatment of fractures; as near a coaptation of the lacerated ends as possible, with immobility, being the necessary objects to secure. The first is a matter of very difficult accomplishment, by bandaging alone, and some have recommended instead the application of charges or blisters. To these we strongly object from their liability to cause irritation and to allow of excessive movement, both circumstances being unfavorable in their influence and hindering the action of the reparative powers.

To secure the necessary immobility the animal should be placed in slings snugly applied, and kept in a narrow stall. He should also be tied short, and restrained from any backward movement by ropes or boards, and he should moreover be kept in as quiet a temper as possible by the exclusion of all causes of irritation or excitement. Weeks must then elapse, not less, but frequently more than six, often eight, before he can be considered out of danger and able to return to his labor, which should for a time be light and easy, and only gradually, if ever, increased to the measure of a thoroughly sound and strong animal.

SUNDRY ADDITIONAL AFFECTIONS OF THE EXTREMITIES.

Among these there are three which will principally occupy our attention, and these may be considered as forming a single group. In some parts of the legs may be found certain peculiar little structures, of a sac-like formation, containing an oily substance designed for the lubrication of the parts upon which they are placed for the purpose of facilitating the movements of the tendons which pass over them. These little sacs or muco synovial capsules are liable under peculiar conditions of traumatism to become subject to a diseased process, which consists principally in a hyper-secretion of their contents and an increase in dimensions, and they may undergo peculiar pathological changes of a character to disable an animal, and in many instances to cause serious blemishes which can not but depreciate his value. These growths, which are known as hygromata, may result from external violence, as blows or bruises, and may appear in the form of small, soft tumors, painless and not inflammatory in character, but, by a repetition of the cause or renewal of violence, likely to acquire a new severity. Severe inflammation may supervene, with suppuration, which filling up the cavity, the walls will become thickened and hard, and the formation of a tumor follow, which, resisting all forms of treatment, can only be made to disappear by subjecting them to the edge of the bistoury.

The elbow, the knee, and the hock are the principal parts of the body where these lesions are ordinarily found, and on account of their peculiar shape and the position they occupy they have received the denomination of being *capped.* We shall consider them in their peculiar aspect.

Capped elbow.—The shoe boil, commonly so called, is almost too well known to require a definition from us. An enlargement at the point of the elbow is the lesion, so called, which is simply the result of pressure of the heels of the shoe upon that part. There are, of course, some conditions necessary for the development of the shoe boil, and for the pressure of the heels upon the spot where it occurs. Excessive length in the shoe and a formation of the animal with a cannon bone so long that the flexure of the knee brings the heel in contact with the elbow, may be termed the predisposing causes, but to these must be added another necessary condition in the peculiar mode of resting adopted by the affected animal, as exhibited in his manner of lying down, which is that of the cow, by resting upon the breastbone with the legs flexed under the body—a most eligible and natural posture for effecting the result which follows.

The heel just pressing against the elbow, the hard iron of the shoe in contact with the soft skin, with the weight of the body added, forms a combination of causes which can not well fail to produce the bruise which in fact does follow, and which soon afterwards becomes characterized by a variety of symptoms—for a capped elbow does not always exhibit the same aspect. In one case, there is simply a bruise, with symptoms of inflammation more or less marked or severe. The parts will be swollen, sometimes enormously, with heat and pain, the swelling not only covering the point of the elbow, but sometimes reaching the axilla, and assuming such proportions that there is great difficulty in using the leg, the animal showing signs of lameness even to the extent of the circumflex step, as in shoulder lameness. This œdematous condition, however, does not remain stationary. It may by degrees subside or perhaps disappear. In the first instance it will become more distinctly defined, with better marked boundaries, until it is reduced to a soft, round, fluctuating tumor, with or without heat or pain. There is then either a bloody or serous tumor or a purulent collection, and following the puncture of its walls with the knife there will be an escape of blood, of serum, or of pus, as the case may be, in variable quantities. In either case, but principally in that of the cystic form, the tumor will be found to be subdivided by septums or bands running in various directions.

Various changes will follow the opening of the tumor and the escape of its contents. In a majority of cases, the process of cicatrization will take place, and the cavity fill up by granulation, the discharge, at first abundant, gradually diminishing and the wound closing, usually without leaving any mark. At times, however, and especially if the disease

has several times repeated its course, there may remain a pendulous sac, partly obliterated, which a sufficient amount of excitement or irritation may soon restore to its previous dimensions and condition.

In other cases an entirely different process takes place. The walls of the cavity, cyst, or abscess become ulcerated and thickened, the granulations of the sac become fibrous in their structure and fill up the cavity, and it assumes the character of a hard tumor on the back of the elbow, sometimes partly and sometimes entirely covered by the skin. It is fibrous in its nature, painless to the touch, well defined in its contour, and may vary in size from that of a small lady apple to that of a child's head.

This last form of capped elbow is the most serious of any, resisting all known forms of mild treatment, and removable by the knife only. The other forms, even that with the inflammatory aspect and its large œdematus swelling which interferes with the work of the animal, may justify a much milder prognosis, and aside from their liability to recur may be ranked with the comparatively harmless affections.

So long as the danger of recurrence is the principal bad feature of capped elbow, the most important consideration is that of devising a means of its prevention by curing the animal of his habit of resting in the cow-like posture of sternal decubitus. To prevent the animal from lying down is evidently the simplest method of keeping the heels and the elbow apart. But the impracticability of this prescription is apparent, since a majority of animals are obliged to lie down when they sleep, though it is true that a few take their sleep on their feet. The question of shoeing here enters into the discussion. The shortening of the inside branch of the shoe, which is the one with which the pressure is made, may be of advantage, and especially if the truncated end of the shoe is smooth and filed over to remove all possibility of pressure and contusion upon the skin. The protection of the skin of the elbow by interposing soft tissues between that and the shoe, or by bandaging the heel with bags, or covering it with boots, is considered by many the best of the preventive methods, and the advantage to be secured by resorting to it can not be overlooked when the number of horses, which develop shoe boil whenever the use of the boot is intermitted, is considered. In order to prevent the animal from assuming the sternal decubitus, many give preference to the plan of fastening a piece of wood across the stall at some distance from the front wall or manger. It is a simple expedient, primitive perhaps, but nevertheless practical and followed by good results.

The therapeutic treatment is also important. The œdematous swelling, indicative by its external appearance and the existing inflammation of the diseased condition, requires the use, without delay, of all the means attainable for its abatement, with the accompanying pain and the heat, with whatever may tend to accelerate the absorption of the exudate. Warm fomentations, repeated several times daily, are then

indicated, the degree of warmth being as high as can be comfortably borne. They are of easy application, and often yield important relief in a few hours. In some cases, however, astringents are used in preference, in the form of poultices or pastes, which are made to cover the entire swelling and allowed to remain, drying after a short time, it is true, and perhaps falling off, but easily renewed and reapplied. We have often recommended for these cases (and we renew our indorsement) a putty made of common chalk, powdered, and vinegar (acetate of lime—an excellent astringent), and covering the whole swelling with a thick coating of soft clay, made into a softish mass with water. It has proved very beneficial in our experience.

These simple remedies are often all that is required. Under their use the swelling passes off by degrees and after a short interval the animal is remanded to his work again. But not uncommonly, instead of this a tumor or lump develops itself, puffy, not painful, and perhaps giving a sensation of crepitation when pressure is made on it. It is soft and evidently contains a liquid, and when freely opened, with a good-sized incision, discharges a certain amount of blood, partly liquid and partly coagulated, and perhaps a little hemorrhage will follow. The cavity should then be well washed out and a tent of oakum introduced leaving a small portion protruding through the cut to prevent it from closing prematurely. It may be taken off the next day, and a daily cleansing will then be all that is necessary. In another case the tumor becomes very soft in its whole extent, with evident fluctuation and a well-defined form. The discharge of the fluid is then indicated, and a free incision will be followed by the escape of a quantity of thin, yellowish liquid from a single sac. The irritation of the lining membrane with the finger nails, and the introduction of a tent of oakum, as before, but which should be changed every two or three days, during which time the parts should be kept free from suppuration, will inaugurate a speedy change and recovery will soon follow. But if the cavity is found to be subdivided in its interior by numerous bands, and the cyst proves to be multilocular, the partitioning sacules should be torn out with the fingers, and the cavity then treated in the same manner as the single or unilocular sac. Another condition is that when the tumor is warm and has been painful, and has been soft and fluctuating indistinctly, or only at a given point, the evidence is of an abscess again indicating the use of the knife for a free incision for the exit of the contents, the general and first indication in all suppurative collections.

But cases occur when all the treatment that has been detailed has failed to effect a full recovery, and, instead of closing properly, the cavity has become the seat of granulations other than those of a healthful and benign character, having assumed a new and peculiar form, and appearing in that of a fibrous tumor, quite apt, if not evicted, to constitute a mere eyesore, profitable and pleasing to no one. A change of treatment is of course then in order. The inflammation, having a dis-

position to become chronic, will require stimulating treatment in order to counteract that tendency by the quickened activity of the process of absorption, and we must again draw upon the resources of experience in the form of the blisters, the fomentations, the iodine and the mercurial helps as heretofore mentioned. Good results may always be insured from their judicious and timely administration while combatting the aberrations of nature, but little, from them or from any of the allies of the curative art, by their unintelligent and misdirected employment. In applying the powerful mineral inunctions much patience and wisdom are demanded. It should be done by carefully and perseveringly rubbing in small quantities daily; it should be done softly and gently, not with force of arms, nor with the expectation of producing an astonishing effect by heavy dosing and main strength in a few hours; it should be after the manner of a siege rather than that of a charge. The object must be to induce the drugs to permeate the affected part until the entire mass is penetrated. Of course cases will be encountered which resist every form of treatment but the last of all (in dealing with external and excessive growths). The tumor remains as a fixed fact; it continues to grow; it is large and pendulous at the elbow; its weight is estimated in pounds; it is not an eyesore merely, but an uncomfortable, burdensome mass, excoriating all the surrounding parts and being itself excoriated in turn; mild treatment has failed and is no longer to be relied on. There is no longer an alternative between the abandonment of the patient and the amputation of the tumor. But there is a choice of modes and instrumentalities, a question of preference between the ligature, the electric cautery, and the bistoury. Each has its advocates among practitioners. In a case like the present, one of the practical embarrassments arises in connection with the application and retention of bandages and other dressings after the amputation has been performed. It is a somewhat difficult problem, owing to the conformation and proportions of the body of the patient, and involves the exercise of a considerable amount of practical ingenuity to adjust and retain the appliances necessary to insure a good final result in obtaining a proper cicatrix.

In our long description of the treatment of the varieties of capped elbow we have thus far omitted any mention of one method which has to some extent received the sanction of experience, and which is practiced and commended by not a few. We refer to the use of setons, introduced through and through the tumor. We mention it to say that our experience is adverse to this mode. We are led to this opinion not only by our observation of many failures, but from the fact that in many cases the use of the seton has been followed by the formation of large fibrous tumors, which in our opinion have resulted from it.

Capped knee.—The passage of the tendons of the extensor muscle of the cannon, as it glides in front of the knee joint, is assisted by one of the little bursæ we have before mentioned, and when this becomes

the seat of a dropsical collection a hygroma is formed and the knee is "capped." Though somewhat analogous in its history to the capped elbow, there are points of difference between them. Their development may prove a source of great annoyance from the fact of the blemish which they constitute.

The capped knee presents itself under various conditions. It is sometimes the result of a cause nearly unique, as when it follows a bruise or contusion, often repeated, inflicted upon himself by a horse addicted to the habit of pawing while in the stable and striking the front of his stall with his knees. Another class of patients is formed of those weak-kneed animals which are subject to falling and bruising the front of the joint against the ground, the results not being always of the same character.

The lesion may be a simple bruise, or it may be a severe contusion with swelling, œdematous, hot, painful, and interfering with locomotion, the joint becoming stiff and sometimes so rigid that the animal is unable to flex it, and still, under simple treatment, the trouble may subside almost by spontaneous action.

Or, again, instead of altogether passing off, the œdema may diminish in extent, becoming more defined in form and remain as a tumor more or less developed on the front part of the knee. Resulting from the crushing of small blood vessels, this is essentially a bloody tumor. It is somewhat soft, not painful, surrounded by a little swelling, round, more or less fluctuating, and after a few days becomes crepitant under the pressure of the hand.

But instead of possessing all the characteristics of a bloody tumor it may also assume those of a serous growth, as often occurs when the violence (the bruise), though perhaps slight, has been frequently repeated. In that case the tumor becomes better defined, generally painless, without any surrounding swelling, is much softer, is fluctuating, and more or less pendulous.

In other cases, however, this serous tumor becomes the seat of an acute inflammation, perhaps from repetition of the original violence; or it may set in as the immediate result of the bruise, and a phlegmonous inflammation may thus be established. The tumor is now surrounded with œdema, more or less diffused, and becomes hot and painful. The flexion of the knee can no longer take place; walking is much interfered with—a large acute abscess has been formed, and it is this that constitutes the *capped knee.*

Whatever may be the nature of the tumors, whether shown when opened to be bloody, cystic, or purulent, or when they ulcerate as they sometimes do, though the cavity of the abscess may fill up in a short time, the probability is that there will always remain in front of the knee a plastic deposit, developed in varying degrees, which will resist all treatment and continue unabsorbed for life.

Though simple bruises of the knee without extensive lesions are usu-

ally of trifling account, a different prognosis must be pronounced when the lesion assumes more important dimensions; and though a capped knee may be comparatively an affair of little importance we have seen cases where not only extensive blemishes were left to disfigure the patient, but where the animals had become worthless in consequence of the extension of the diseased process to the various elements of structure composing the joint, and giving rise to the most complicated cases of carpitis.

We have seen that usually the first symptom which is observed is the œdematous swelling on the fore part of the knee, the first lesion, in fact, and therefore requiring immediate attention. The prevention of the inflammation, and consequently of the abscess, is the prime object in view, and it may be realized by the use of warm water fomentations or compresses applied over the swelling, which may be used either in a simple form or combined with astringents, such as Goulard's extract, alum, or sulphate of zinc. The application of warm poultices of oil meal or ground flaxseed, enveloping the whole joint and kept in place by bandages, is often followed by absorption of the swelling, or, if the abscess is in process of formation, by the active secretion of pus. If the formation of a tumor has followed this treatment, or if it has developed from its inception, it becomes an immediate necessity to empty it, and the mode of accomplishing this will vary with different cases. In one it should be done by a careful incision, which will allow the escape of the blood of the serum, or of the pus which is inclosed in the sac; in another it may be by means of a seton, in order that the discharge may be maintained and allowed to escape; and for another the more cautious mode may be adopted of emptying the cavity by means of punctures with small trochars or aspirators. The danger attending this last method arises from the possible sloughing of large portions of the skin, while that attending the first is the hazard of the possibility of the extension of the inflammation to the capsular ligament of the knee, with the risk of an open joint in prospect.

As we have remarked, the cavity, after being emptied, may rapidly close and leave in a short time but slight traces of its previous existence. But in many, if not in a majority, of cases there will remain after the cicatrization is complete a thickening or organized exudation, at one time round and well defined, at another spreading by a diffused infiltration, to which it will be necessary to give immediate attention, from the fact of its tendency to form into an organized and permanent body. To stimulate inflammation in this diseased structure blisters are recommended, but chiefly for the purpose of promoting the process of absorption. If this treatment should fail, the use of alteratives proper is recommended, mercury and its compounds and iodine preparations probably receiving a majority of suffrages. Plain mercurial or plain iodine ointment, or both in combination as iodide of mercury, are commonly used, and may either be applied moderately and by gentle de-

grees, as we have suggested, or more freely and vigorously with a view to more immediate effects, which, however, will also be more superficial. The use of the firing iron applied deeply with fine points is then to be strongly recommended, to be followed by blisters and various liniments. This course may generally be relied on as quite sure to be followed by satisfactory results.

While the treatment is in progress it will of course be necessary to secure the animal in such a manner that a recurrence of the injury will be impossible from similar causes to those which were previously responsible.

Capped hock.—A bad habit prevails among some horses of rubbing or striking the partitions of their stalls with their hocks, with the result of an injury which shows itself on the upper point of that bone, the summit of the *os calcis*. From its analogy to the condition of capped elbow the designation of capped hock has been applied to this condition.

A capped hock is therefore but the development of a bruise at the point of the hock, which if many times repeated may excite an inflammatory process, with all its usual external symptoms of swelling, heat, soreness, and the rest of the now familiar phenomena. The swelling is at first diffused, extending more or less on the exterior part of the hock, and in a few instances running up along the tendons and muscles of the back of the shank. Soon, however, unless the irritating causes are continued and repeated, the œdema diminishes, and becoming more defined in its external outlines, leaves the hock capped with a hygroma. The hygroma, at the very beginning of the trouble, contains a bloody serosity which soon becomes strictly serum, but through the influence of an acute inflammatory action is liable to undergo a metamorphosis which converts it into the product of the suppurative process.

The external appearance ought to be sufficient to determine the diagnosis, but there are a few signs which may contribute toward a nicer identification of the lesion. The capped hock, whether under the appearance of an acute œdematous swelling, or as a sero-bloody collection, or as a simple serous cyst, does not give rise to any remarkable local manifestation other than such as have already passed under our survey in considering similar cases, nor will it be likely to interfere with the functions which belong to the member in question, unless it assumes very large dimensions and on each side of the tendons, as well as on the summit of the bone. But if the inflammation is quite high, if suppuration is developing, if there is a true abscess, or—and this is a common complication—especially when the kicking or rubbing of the animal is frequently recurring, then, besides the local trouble of the cyst or of the abscess, the bones become diseased and the periosteum inflamed; perhaps the superior ends of the bone and its fibro-cartilage become affected, and a simple lesion or bruise, whatever it may have been, becomes complicated with periostitis and ostitis, and is naturally accom-

panied with lameness, developed in a greater or less degree, which in some cases may be permanent and in others increased by work. But these complications are not common or frequent.

Capped hocks are in many cases amenable to treatment, and yet they often become the opprobrium of the practitioner by remaining, as they frequently do, an eyesore on the top of the hock; not interfering, it is true, with the work of the horse, but fixing upon him the stigma of what, in human estimation, and especially in that of the tribe of "practical politicians," is a most unreliable and objectionable reputation, to-wit, that of being a habitual "kicker," and, worse than all, one that kicks where he receives his provender.

The maxim that "an ounce of prevention is worth a pound of cure" fits the present case very neatly. A horse whose hocks have a somewhat puffy look and whose skin on the front of the hock is loose and flabby, justly subjects himself to a suspicion of his addictedness to this bad habit. But he may easily be either convicted or exonerated—a little watching will soon establish the truth. If, then, the verdict is one of conviction, precautions should be immediately adopted against a continuance of the evil. The padding of the sides of the stall with straw mats or mattresses and covering the posts with similar material in such a manner that no hard surface shall be exposed with which to come in contact, will reduce the evil to its minimum. He may jar his frame when he kicks, but even then there will be less force in the concussion than if it impinged upon the solid plank, and cuts and abrasions can not be inflicted by a properly made cushion. Hobbles are also rightly recommended with a view to the required restraint of motion, so applied as to secure the leg with which the kicking is performed, or even both hind legs, yet in such a manner as shall not interfere with the movements of lying down and rising again and yet allowing that of kicking backwards. Boots similar in pattern to those which are used for the prevention of shoe boil are also prescribed. These are placed above the hock and retained by straps tightly fastened. But we apprehend that the difficulty of retaining them in the proper place without the danger of chafing from the tightness of the straps might form an objection to their use. Notwithstanding all precautions, hocks will be capped in the future as in the past, and the study of their treatment will always be in order.

The mode of dealing with them will of course be greatly influenced by the condition of the parts. When the inflammation is excessive and the swelling large, hot, and painful to the touch, the application of warm water will be very beneficial. The leg should be well fomented several times a day, for from fifteen to twenty minutes each time, a strong decoction of marsh-mallow leaves being added to the water, and after each application swathed with flannel bandages soaked in the same warm mixture. A few days of this treatment will usually effect

a resolution of the inflammation, if not complete, at least sufficiently so to disclose the correct outlines of the hygroma and exhibit its peculiar and specific symptoms. The expediency of its removal and the method of accomplishing it are then to be considered, with the question of opening it to give exit to its contents. If the fluid is of a purulent character the indication is in favor of its immediate discharge—no time should be lost, and it should be by means of a small opening made with a narrow bistoury. If, however, the fluid is a serosity, we prefer to remove it by punctures with a very small trochar. Our reason for special caution in these cases is our fear of the possibility of the existence of diseased conditions of a severe character in the pseudo joint. For the same reason we prefer the treatment of those growths by external applications. In the first stages of the disease a severe and stiff blister entirely covering the cyst, perhaps not yet completely formed, when the inflammation has subsided will be of great benefit by its stimulating effect, the absorption it may excite, and the pressure which when dry it will maintain upon the tumor. If, however, the thickening of the growth fails to diminish it should be treated with some of the iodine preparations in the form of ointments, pure or in combination with potassa, mercury, etc., of various strengths and in various proportions. Our opinion of setons is not favorable, but the actual cautery, by deep and fine firing, in points—needle cauterization—we believe to be the best mode of treatment, and especially when applied early.

Whatever treatment may be adopted for capped hock, patience must be one of the ingredients. In these parts absorption is slow and the skin is very thick, and its return to a soft, pliable, natural condition, if effected at all, will only take place after weeks added to other weeks of medical treatment and patient waiting.

Interfering—Speedy cuts.—These designations belong to certain special injuries of the extremities, produced by similar causes, giving rise to kindred pathological lesions with allied phenomena, requiring about the same treatment and often followed by the same results, to-wit, a blemish which may not only subject the animal to a suspicion of unsoundness, but in some special circumstances interfere with his ability to labor. It is known as "interfering" when the location of the trouble is the inside of the fetlock of either the fore or hind leg. It is called "speedy cut" when it occurs on the inside of the fore leg, a little below the knee, at the point of contact of that joint with the cannon.

It is always the result of a blow, self-inflicted, of varying severity, and giving rise to various lesions. At times the injury is too slight to be seriously noticed, the hair being scarcely cut and the skin unmarked. At other times the skin will be cut through, partly or wholly, and it may for the time cause a sufficient amount of pain to check the motion of the animal and induce him to suspend his labor through his inability to use the wounded limb, traveling meanwhile for a short space on three legs only. Sometimes a single blow will suffice, or again there will be

a repetition of lighter strokes. In the latter case the parts will become much swollen, hot and so painful to the touch that the motion of the knee or the fetlock will be sufficiently disturbed to cause lameness of a degree of severity corresponding with that of the lesion. Following the subsidence of this diffused and œdematous swelling is sometimes the formation of a tumor, either at the knee or the fetlock. This may be soft at first or become so by degrees, with fluctuation, its contents being at first extravasated blood, and later a serosity; or, if there has been a sufficient degree of inflammation, it may become suppurative. The result of the fault of interfering may thus be exhibited, whether at the knee or at the fetlock, as characterized by all the pathological conditions which have appeared as accompaniments of capped knee or capped hock. If, in consequence of the force of the blow or blows, the inflammation has been unusually severe, a mortification of the skin may become one of the consequences, a slough taking place, succeeded by a cutaneous ulcer on the inside of the fetlock or where the greater number of the original wounds are inflicted. If the interfering has been often repeated it may be followed by another condition, which has been considered in our remarks upon other affections. It is a plastic exudation or thickening of the parts, which are commonly said to have become "callous," and the effect of it is to destroy the regularity of the outlines of the joint to an extent which constitutes a serious blemish, which will be permanent, and according to the degree of the aberration from the natural and symmetrical lines will inevitably depreciate the commercial value of the animal.

An animal in interfering may thus exhibit a range of symptoms which, from the simplest form of a mere "touching," may successively assume the serious characters of an ugly cicatrix, a hard, plastic swelling, or perhaps, as witnessed at the knee, of periostitis with its sequelæ.

If a single and constantly recurring cause—a blow—be the starting point in interfering, we may now consider the subject of the predisposition which brings such serious results upon the suffering animal, and the conditions which lead to and accompany it. These are numerous, but the first in frequency and importance is peculiarity of conformation in the animals addicted to it. The first class will include horses whose chest is narrow and whose legs do not stand straight and upright, but are crooked and pigeon-toed in and out. The second class includes those whose legs are weak, either from youth or hard labor, or from severe attacks of sickness. Another class is made up of those having abnormally developed feet, or which have been badly shod with unnecessarily wide or heavy shoes. Another class consists of those that are affected with swollen fetlocks or chronic œdematous swelling of the leg. Another is formed of animals with a peculiar action, as those whose knee action is very high, and it is these that furnish most of the cases of speedy cut.

The prognosis of interfering is never a very serious one. However violent the blow may be it is rarely that subsequent complicatious of a troublesome nature occur. The principal evil attending it is a liability to be followed by a thickened or callous deposit which is not only an eyesore and a blemish, but constitutes a new and increased predisposition. The remark that "an animal which has interfered once is always liable to interfere," is often confirmed and sanctioned by a recurrence of the trouble.

Another point in which there is a resemblance between this lesion and others which we have considered is in its responsiveness to the same treatment with them. Indeed, the prescription of warm fomentations, soothing applications, and astringent and resolvent mixtures, in a majority of cases, is the first that occurs all through the list. If the swelling assumes the character of a serous collection, pressure, cold water and bandages will contribute to its removal. If suppuration seems to be established, and the swelling assumes the character of a developing abscess, the hot poultices of flaxseed or of boiled vegetables and the embrocations of suppurative or sedative ointments, those of basilicon, or propuleum, impregnated with preparations of opium or belladonna—all these recommend themselves by their general adaptation and the beneficial results which have followed their administration, not less in one case than in another. When an abscess has formed and is fluctuating, it should be carefully but fully opened to evacuate the pus. If it is a serous cyst, some care is necessary in emptying it, and the possibility of the extension of the inflammation to the joint must be taken into consideration. When the cavities have been emptied and have closed by filling up with granulations, or if, not being opened, the contents have been reabsorbed, and there remains in either case a plastic exudation and a tendency to the callous organization that may yet exist, blisters under their various forms, including those of cantharides, of mercury, and of iodine are then indicated, principally in the early stages, as it is then that their effects will prove most satisfactory. The use of the actual cautery, with fine points, penetrating deeply throughout the enlargement, has in our hands, when employed in the very early stages of its formation, nearly always brought on a radical recovery with complete absorption of the thickening.

Stringhalt.—The characteristic symptom, if not in fact the sum of the symptomatology of this disease, is the spasmodic flexion, more or less violent, of the hock, sometimes to the extent of striking the abdomen with the fetlock of the affected leg, and at others only sufficient to lift it a few inches from the ground, but always with the same sudden, uncontrollable jerk. The habit is unaffected by the gait of the animal, and whether trotting, walking, or merely turning around, it is all the same. It does not seem to be influenced by the horse's age, young and old being alike affected. Its first manifestatious are sometimes very slight. It has been noticed as occurring to an animal when backing

out of his stable and ceasing immediately after. In some animals it is best seen when the animal is turning around on the affected leg, and is not noticed when he moves straight forward. That this peculiar action interferes with facility of locomotion and detracts from a horse's claim to soundness can not for a moment be denied.

Veterinarians and pathologists are yet in doubt in respect to the cause of this affection, as well as to its essential nature. Whether it results from disease of the hock, of an ulcerative character; whether it springs from a malformation; whether it is purely a muscular or purely a nervous lesion, or a compound of both, it still continues, if an etiologist is bound to possess universal knowledge within the scope of his special studies, to be his opprobrium and his puzzle.

Various experiments in the line of treatment have been instituted, but none have been crowned with satisfactory results. We incline to the opinion that some undesignated disease of the hock is responsible for it, and believe that in the present state of knowledge the best prescription that can be devised is the safe and economical one of rest, a long rest in a pasture, where unmolested nature shall be permitted to bring about any necessary change that may be appropriate to the case. Whatever other treatment it may be considered wise to undertake must be of a widely different character, and must be determined upon by those whose chosen and appropriate sphere is the domain of operative surgery.

Embolisms.—There are certain forms of lameness which are very peculiar in their manifestation, and which to the non-professional mind must appear to belong rather to the domain of mystery or theory than to be subjects of experimental and definite knowledge. Yet they are none the less susceptible of demonstration and positive knowledge than many facts which, plain and familiar to the general comprehension now, were once ranked among things occult and unsearchable. An embolism, considered as a cause of lameness, may find a place among these understood mysteries.

Under certain peculiar conditions of inflammation of the blood vessels, clots of blood are sometimes formed in the arteries and find their way in the general circulation. At first, while very small, or sufficiently so to pass from one vessel to another, they move from a small vessel to a larger, and from that to one still larger, constantly increasing in size until at some given point, from their inability to enter smaller vessels, their movement is finally arrested. The artery is thus effectually dammed, and the clot in a short time cuts off completely the supply of blood from the parts beyond. This is the embolism, and it often gives rise to sudden and excessive lameness of a very painful character.

Embolisms may form in any of the arteries of the body, and doubtless have been the cause of many cases of lameness which could never be accounted for. If they exist in small arteries their diagnosis will probably fail to be made out with certainty, but when situated in the

larger trunks a strong suspicion of their presence may be excited. In some cases they may even be recognized with positive accuracy, as when the vessels which supply the posterior extremities are affected by the blocking up of the posterior aorta or its ramifications.

The existence of embolisms of the arteries of the hind leg may always be suspected when the following history is known: The general health of the animal is good, but symptoms of lameness in one of the legs have been developed, becoming more marked as he is worked, and especially when driven at a fast gait. But the disturbance is not permanent, and the lameness disappears almost immediately upon his being permitted to rest. There is an increase of the difficulty, however, and, though he may walk normally, he will, when made to trot, very soon begin to slacken his pace and to show signs of the trouble, and if urged to increase his speed will become lamer and lamer; an abundant perspiration will break out; he will refuse to go, and if forced he shows weakness behind; seems ready to fall, and perhaps does fall. While on his feet the leg is kept in constant motion, up and down, and is kept from the ground as if the contact was too painful to bear. If undisturbed this series of symptoms will gradually subside, sometimes very soon, and occasionally after a few hours he will return to an apparently perfect condition. A return to labor will lead to a renewal of the same incidents.

A history like this suggests a strong suspicion of embolism of an artery of the hind leg, and this suspicion will be confirmed by the external symptoms exhibited by the animal. The total absence of any other disease which might account for the lameness, and a manifest diminution of heat over a part or the whole of the extremity, when compared with the opposite side or with any other portion of the body; a sensation of cold attendant on the pain, but gradually subsiding as the pain subsides, and the circulation, quickened by the rest, has been reëstablished throughout the extremity; all these are confirmatory circumstances. Still, it is thus far only a suspicion, and absolute certainty is yet wanting. To establish the truth of the case the rectal taxis must be resorted to. The hands then, well prepared and carefully introduced into the rectum, must explore for the truth, first feeling for the large blood vessels which, dividing at the aorta, separate to supply the right and left legs. These must be compared in respect to the pulsation and other particulars. The artery which is healthy will of course exhibit all the proper conditions of that state. On the other hand, if the vessel appears to the feel hard, more or less cordy, and pulseless, or giving a sensation of fluttering, as of a small volume of blood with a trickling motion passing through a confined space, the difference between the sides will make the case plain. The first will be the full flow of the circulation through an unobstructed channel, the other a forced passage of the fluid between the embolism and the coats of the artery.

In such a case the prognosis is necessarily a grave one. No form of treatment can be advised; and the suffering of a helpless and useless animal can only be terminated by that which ends all.

Cases occur, however, where this condition of the blood-vessels exists in a much less degree, and the diseased condition is not sufficiently pronounced for final condemnation. There may even be a possibility of the absorption of the clot, and that an increase of the circulation may be sufficient to supply the parts with blood. In such cases attempts may be made looking to the possibility of relief, and the pasture, field, or the stable, and unmolested nature must be trusted for the rest.

Sprains of the loins.—This is an affection which suggests to the mind the idea of muscular injury, and is difficult to distinguish from many similar cases. If the animal shrinks from the slightest pressure or pinching of the spine, in the region of the loins, he is by many pronounced to be "lame in the loins," or "sprained in the loins," or "weak in the kidneys." This is a grave error, as in fact this simple and gentle yielding to such a pressure is not a pathological sign, but is normal and significant of health. Yet there are several conditions to which the definition of "sprains of the loins" may apply which are not strictly normal. The muscles of the back and those of the loins proper, as the psoas, may have been injured, or again there may be trouble of a rheumatic nature, perhaps suggestive of lumbago. Diseases of the bones of the vertebral column, or even those of the organs of circulation, may give rise to an exhibition of similar symptoms. These symptoms are characteristic of a loss of rigidity or firmness of the vertebral column, both when the animal is at rest and in action. In the former condition, or when at rest, there is an arched condition of the back and a constrained posture in standing, with the hind legs separated. In the latter there is a lateral, balancing movement at the loins, principally noticeable while the animal is in the act of trotting—a peculiar motion, sometimes referred to as a "crick in the back," or what the French call a "*tour de bateau.*" If, while in action, the animal is suddenly made to halt, the act is accompanied with much pain, the back suddenly arching or bending laterally, and perhaps the hind legs thrown under the body, as if unable to perform their functions in stopping, and sometimes it is only accomplished at the cost of a sudden and severe fall. This manifestation is also exhibited when the animal is called upon to back, when a repetition of the same symptoms will also occur.

If a slight pressure on the back or the loins is followed by a moderate yielding of the animal, it is, as we before remarked, a good sign of health. With a sprain of the loins pressure of any kind is painful, and will cause the animal to bend or to crouch under it more or less, according to the weight of the pressure. Heavy loads, and even heavy harnessing will develop this tenderness. In lying down he seems to suffer much discomfort, and often accompanies the act with groaning, and when compelled to rise does so only with great difficulty and seldom succeeds without repeated efforts.

Sprains of muscles proper, when recent, will always be accompanied by this series of symptoms, and the fact of their exhibition, with an excessive sensibility of the parts, and possibly with a degree of swelling, will always justify a diagnosis of acute muscular lesion; and especially so if accompanied by a history of violent efforts, powerful muscular strains, falls, heavy loading, etc., connected with the case. But if the symptoms have been of slow development and gradual increase, it becomes a more difficult task to determine whether the diagnosis points to pathological changes in the structure of the muscles or of the bones, the nervous centers or the blood-vessels of the region. And yet it is important to decide as to which particular structure is affected in reference to the question of prognosis, since the degree of the gravity of the lesion will depend largely upon whether the disabled condition of the animal is due to an acute or a chronic disease. The prescription which will necessarily first of all suggest itself for sprains of the loins is rest. An animal so affected should be immediately placed in slings and none of his efforts to release himself should be allowed to succeed. Hot compresses, cold-water douches, sweating applications, stimulating frictions, strengthening charges, blistering ointments of cantharides and the actual cautery, all have their advocates; but in no case can the immobility obtained by the slings be dispensed with. In many cases electricity has also yielded good results, where the weakness of the hind quarters was dependent on disease of the nervous centers.

PLATE XX

Hames, del. after Colin

SKELETON OF [illegible]

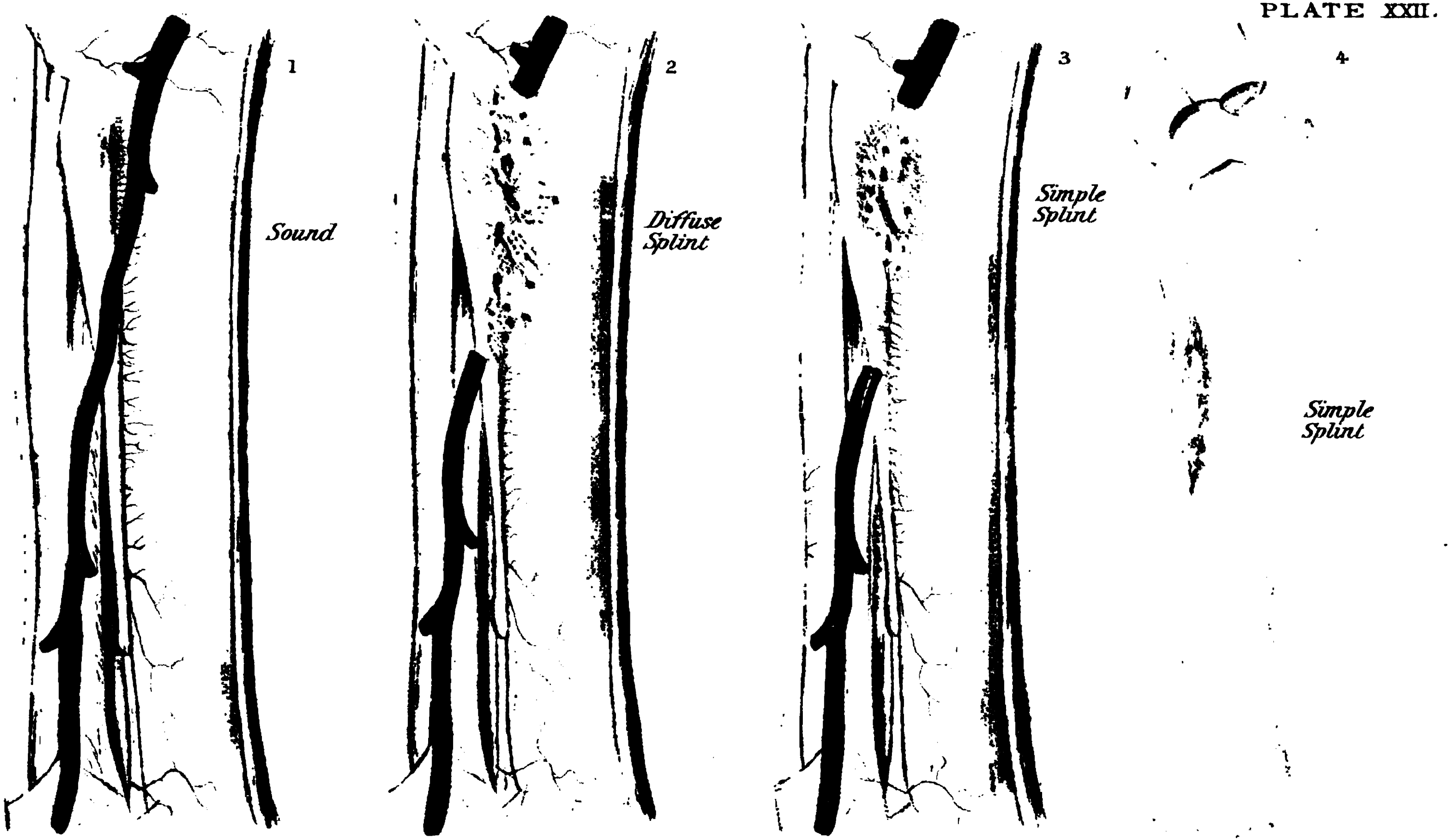
[illegible] & Wilhelms Litho Co N Y

PLATE XXI.

del. after Mégnin

SUPERFICIAL LAYER OF MUSCLES.

PLATE XXII.



s, del. Nos. 1, 2 and 3, from Auzoux model. No. 4, Original.

Sackett & Wilhelms Litho Co. N Y

SPLINT.

1 2 PLATE XXIII.

Flexor-
tendons.

Fetlock
joint

S

d

Int
era

ll of hoof

Hames, del. from Auzoux Model

Sackett & Wilhelms Litho Co. N.Y.

RING BONE.

PLATE XXV.

1

2

Bone Spavin.

Blood Spavin.

Bone Spavin.

3

Bog Spavin.

Curb.

Haines, del.

Haines, del. No.1, Original. No.2, after Berdoz. No.3, modified from Heubner.

Sackett & Wilhelms Litho Co. N.Y.

VARIOUS TYPES OF SPAVIN.

BONE SPAVIN, HOCKS, WITH SKIN REMOVED.

PLATE XXVI

1

2

3/5

4/5

Sound hock.

Curved spavin

3

4

4/5

Spavin.

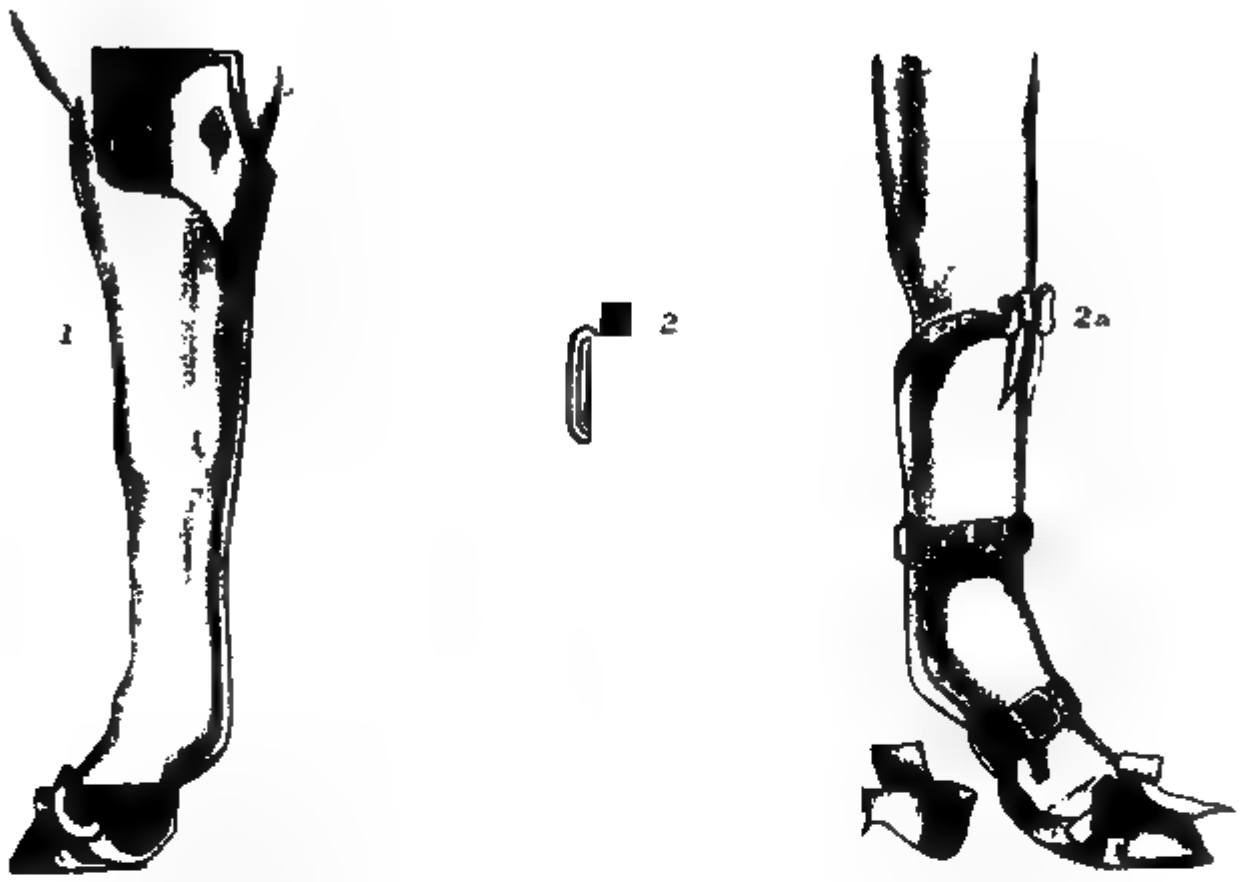
Haines del.

Haines del Nos.1, 2 and 3, Original No. 4 after Percival

Sackett & Wilhelms Lith Co. N.Y.

BONE SPAVIN.

PLATE XXVII.



1, Bruce for dislocation of the elbow applied to the horse. 1a, The same brace seen alone. 2, Bruce for dislocation of fetlock. 2a, The same brace applied to the horse.

3, Bruce for sprained or dislocated shoulder; 3a, The same brace applied to the shoulder.

Haines, del. After Peuch and Toussaint

Sackett & Wilhelms Litho Co. N.Y.

DISLOCATION OF SHOULDER AND ELBOW.

Bourgelat's apparatus.

PLATE XXVIII.

Haines, del. after Reynders.

Sackett & Wilhelms Litho Co. N.Y.

THE SLING IN USE

DISEASES OF THE FETLOCK, ANKLE, AND FOOT.

BY A. A. HOLCOMBE, D. V. S.

ANATOMICAL REVIEW OF THE FOOT.

In a description of the foot of the horse it is customary to include only the hoof and its contents, yet, from a zoölogical standpoint, the foot includes all the leg from the knee and the hock down.

The foot of the horse is undoubtedly the most important part of the animal, in so far as veterinary surgery is concerned, for the reason that this member is subject to so many injuries and diseases, which, in part or in whole, render the patient unfit for the labor demanded of him. The old aphorism, "no foot no horse," is as true to-day as when first expressed; in fact, domestication, coupled with the multiplied uses to which the animal is put, and the constant reproduction of hereditary defects and tendencies, have largely transformed the ancient "companion of the wind" into a very common piece of machinery which is often out of repair, and, at best, is but short-lived in its usefulness.

Since the value of the horse depends largely, or even entirely upon his ability to labor, it is essential that his organs of locomotion should be kept sound; and to accomplish this end it is necessary not only to know how to cure all diseases to which these organs are liable, but, better still, how to prevent them.

An important prerequisite to the detection and cure of disease is a knowledge of the construction and function of the parts which may be involved in the diseased process; hence, first of all, the anatomical structures must be understood.

The bones of the fetlock and foot constitute the skeleton on which the other structures are built, and comprise the lower end of the cannon bone (the metacarpus in the fore leg, the metatarsus in the hind leg), the two sesamoids, the large pastern or suffraginis, the small pastern or coronet, the coffin bone or os pedis, and the small sesamoid or navicular bone. (Plate XXXII, Fig. 3.)

The *cannon bone* extends from the knee or hock to the fetlock, is cylindrical in shape and stands nearly or quite perpendicular.

The *sesamoids* occur in pairs, are small, shaped like a three-faced pyramid, and are set behind the fetlock joint, at the upper end of the suffraginis, with the base of the pyramid down.

The *suffraginis* is a very compact bone, set in an oblique direction downward and forward, and extends from the cannon bone to the coronet.

The *coronet* is a short, cube-shaped bone, set between the suffraginis and coffin bone, in the same oblique direction.

The *coffin bone* forms the end of the foot and is shaped like the horny box in which it is enclosed.

The *navicular bone* is short, flattened above and below, and is attached to the coffin bone behind.

All of these bones are covered on the surfaces with a cartilage of incrustation which goes to make up the joints, while the portions between are covered with a fibrous membrane called the periosteum.

The joints of the legs are of especial importance, since any interference with their function very largely impairs the value of the animal for most purposes. As the joints of the foot and ankle are at the point of greatest concussion they are the ones most subject to injury and disease.

There are three of these joints—the fetlock, pastern, and coffin. They are made by the union of two or more bones, held together by ligaments of fibrous tissue, and are lubricated by a thick viscid fluid, called synovia, which is secreted by a special membrane inclosing the joints.

The *fetlock joint* is made by the union of the lower end of the cannon and the upper end of the large pastern bones, supplemented by the two sesamoids, so placed behind the upper end of the pastern that the joint is capable of a very extensive motion. These bones are held together by ligaments, only one of which—the suspensory—demands special mention.

The *suspensory ligament* of the fetlock starts from the knee, extends down behind the cannon, lying between the two splint bones, until near the fetlock, where it divides and sends a branch on either side of the joint, downward and forward, to become attached on the sides of the extensor tendon at the lower end of the pastern bone. As it crosses the sesamoids on the posterior borders of the fetlock it throws out fibers, which hold it fast to these bones. (Plate XXXII, Fig. 2.)

The *pastern joint* is made by the union of the two pastern bones.

The *coffin joint* is made by the union of the small pastern, coffin, and small sesamoid or navicular bones, the latter being set behind and beneath the joint surface of the coffin bone, in such a way as to largely receive the weight of the small pastern.

Three tendons serve to move the bones of the foot one on another. Two of these flex or bend the joints, while the other extends or straightens the column of bones. (Plate XXX, Fig. 5.)

The *flexor pedis perforans*, or deep flexor of the foot, passes down behind the cannon bone, lying against the suspensory ligament in front, crosses the fetlock joint in the groove made by the union of the two sesamoids, and is attached to the bottom of the coffin bone, after cover-

ing the navicular, by a wide expansion of its fibers. It is the function of this tendon to flex the coffin bone and with it the horny box.

The *flexor pedis perforatus*, or superficial flexor of the foot, follows the course of the preceding tendon and is attached to the middle of the ankle. The function of this tendon is to flex the foot at the fetlock.

The *extensor pedis* runs down in front of the leg, is attached on the most prominent point of the coffin bone, and has for function the straightening of the bones of the ankle and foot.

The bones, ligaments, and tendons are covered by a loose connective tissue, which gives a symmetry to the parts by filling up and rounding off, and all are protected by the skin and hoof.

The *skin* of the fetlock and ankle is generally characterized by its thickness and the length of its hairs, especially around the hind parts of the fetlock joint in certain breeds of horses. The most important part of this envelope is that known as the coronary band.

The *coronary band* is that portion of the skin which secretes the horn by which the wall of the hoof is made. This horn much resembles the nail which grows on the fingers and toes of man. It is composed of hollow, cylindrical tubes, extending from the coronary band to the lower border of the hoof, which are held together by a tenacious opaque matter. (Plate XXIX, Fig. 1.)

The *hoof* is a box of horn, consisting of a wall, sole, and frog, and contains, besides the coffin, navicular and part of the small pastern bones, the sensitive laminæ, plantar cushion and the lateral cartilages. (Plate XXX, Fig. 4.)

The sole of the foot incloses the box on the ground surface, is shaped like the circumference of the foot, except that a V-shaped opening is left behind for the reception of the frog, and is concave on the lower surface. The sole is produced by the velvety tissue, a thin membrance covering the plantar cushion and other soft tissues beneath the coffin bone. The horn of the sole differs from the horn of the wall, in that its tubes are not straight, and from the fact that it scales off in pieces over the whole surface.

The *frog* is a triangular shaped body, divided into two equal parts by a deep fissure, extending from its apex in front to the base. It fills the triangular space in the sole to which it is intimately attached by its borders. The horn of the frog is produced in the same manner as the sole, but it differs from both the wall and sole, in that the horn is soft, moist, and elastic to a remarkable degree. It is the function of the frog to destroy shock and to prevent slipping.

The *sensitive laminæ* are thin plates of soft tissue, covering the entire anterior surface of the coffin bone. They are present in great numbers, and by fitting into corresponding grooves on the inner surface of the horn of the wall the union of the soft and horny tissues is made complete. (Plate XXIX, Fig. 1.)

The *plantar cushion* is a thick pad of fibrous tissue, placed behind and under the navicular and coffin bones, and resting on the sole and frog,

for the purpose of receiving the downward pressure of the column of bones and to destroy shock. (Plate XXIX, Fig. 4.)

The *lateral cartilages* are attached, one on either side, to the wings of the coffin bone by their inferior borders. They are thin plates of fibro-cartilage, and their function is to assist the frog and adjacent structures to regain their proper position after having been displaced by the weight of the body while the foot rested on the ground. (Plate XXIX, Fig. 2.)

FAULTS OF CONFORMATION.

A large percentage of the horses have feet which are not perfect in conformation, and as a consequence of these imperfections they are especially predisposed to certain injuries and diseases.

Flat feet is that condition in which the sole has little or no convexity. It is a peculiarity common to some breeds, especially heavy, lymphatic animals raised on low, marshy soils. It is confined to the forefeet, which are generally broad, low heeled, and with a wall less upright than is seen in the perfect foot.

In flat-foot there can be little or no elasticity in the sole, for the reason that it has no arch, and the weight of the animal is received on the entire plantar surface as it rests upon the ground instead of on the wall. For these reasons such feet are particularly liable to bruises of the sole, corns, pumiced sole, and excessive suppuration when the process is once established. Horses with flat-foot should be shod with a shoe having a wide web, pressing on the wall only, while the heels and frog are never to be pared. Flat-foot generally has weak walls, and as a consequence the nails of the shoe are readily loosened and the shoe cast.

Clubfoot is a term applied to such feet as have the wall set nearly perpendicular. When this condition is present the heels are high, the fetlock joint is thrown forward, or knuckles, and the weight of the animal is received on the toes. Many mules are clubfooted, especially behind, where it seems to cause little or no inconvenience. Clubfoot may be cured by cutting the tendons in severe cases, but as a rule special shoeing is the only measure of relief that can be adopted. The toe should not be pared, but the heels are to be lowered as much as possible, and a shoe put on with a long projecting toe piece, slightly turned up, while the heels of the shoe are to be made thin.

Crooked foot is that condition in which one side of the wall is higher than the other. If the inside wall is the higher, the ankle is thrown outward, so that the fetlock joints are abnormally wide apart and the toes close together. Animals with this deformity are "pigeon-toed," and are prone to interfere, the inside toe striking the opposite fetlock. If but one foot is affected, the other being perfect, the liability to interfere is still greater, for the reason that the fetlock of the perfect leg is more near the center plane.

When the outside heel is the higher the ankle is thrown in and the

toe turns out. Horses with such feet interfere with the heel. If but one foot is so affected, the liability to interfere is less than where both feet are affected, for the reason that the ankle of the perfect leg is not so near to the center line. Such animals are especially liable to stumbling and to lameness from injury to the ligaments of the fetlock joints. The deformity is to be overcome by such shoeing as will equalize the disparity in length of walls, and by proper boots to protect the fetlocks from interfering.

INTERFERING.

An animal is said to interfere when one foot strikes the opposite leg, as it passes by, during locomotion. The inner surface of the fetlock joint is the part most subject to this injury, although, under certain conditions, it may happen to any part of the ankle. It is seen more often in the hind than in the fore legs. Interfering causes a bruise of the skin and deeper tissues, generally accompanied by an abrasion of the surface. It may cause lameness, dangerous tripping, and thickening of the injured parts.

Causes.—Faulty conformation is the most prolific cause of interfering. When the bones of the leg are so united that the toe of the foot turns in (pigeon-toed), or when the fetlock joints are close together and the toe turns out, when the leg is so deformed that the whole foot and ankle turn either in or out, interfering is almost sure to follow. It may happen, also, when the feet grow too long; from defective shoeing; rough or slippery roads; from the exhaustion of labor or sickness; swelling of the leg; high knee action; fast work, and because the chest or hips are too narrow.

Symptoms.—Generally, the evidences of interfering are easily detected, for the parts are tender, swollen, and the skin broken. But very often, especially in trotters, the flat surface of the hoof strikes the fetlock without evident injury, and attention is directed to these parts only by the occasional tripping and unsteady gait. In such cases proof of the cause may be had by walking and trotting the animal, after first painting the inside toe and quarter of the suspected foot with a thin coating of chalk, charcoal, mud, or paint.

Treatment.—When the trouble is due to deformity or faulty conformation it may not be possible to overcome the defect.

In such cases, and as well in those due to exhaustion or fatigue, the fetlock or ankle boot must be used. In many instances interfering may be prevented by proper shoeing. The outside heel and quarter of the foot on the injured leg should be lowered sufficiently to change the relative position of the fetlock joint, by bringing it further away from the center plane of the body, thereby permitting the other foot to pass by without striking.

A very slight change is often sufficient to effect this result. At the same time the offending foot should be shod, that the shoe may set well

under the hoof at the point responsible for the injury. The shoe should be reset every three or four weeks.

When the cause has been removed cold water bandages to the injured parts will soon remove the soreness and swelling, especially in recent cases. If, however, the fetlock has become calloused from long-continued bruising, a Spanish fly blister over the parts, repeated in two or three weeks' time if necessary, will aid in reducing the leg to its natural condition.

KNUCKLING OR COCKED ANKLES.

Knuckling is a partial dislocation of the fetlock joint, in which the relative position of the pastern bone to the cannon and coronet bones is changed, the pastern becoming more nearly perpendicular, with the lower end of the cannon bone resting behind the center line of the suffraginis, while the lower end of this bone rests behind the center line of the coronet. While knuckling is not always an unsoundness, it nevertheless predisposes to stumbling and to fracture of the pastern.

Causes.—Young foals are quite subject to this condition, but in the great majority of cases it is only temporary. It is largely due to the fact that, before birth, the legs were flexed; and time is required, after birth, for the ligaments, tendons, and muscles to adapt themselves to the function of sustaining the weight of the body.

Horses with erect pasterns are very prone to knuckle as they grow old, especially in the hind legs. All kinds of heavy work, particularly in hilly districts, and fast work on hard race-tracks or roads are exciting causes of knuckling. It is also commonly seen as an accompaniment to that faulty conformation called club-foot, in which the toe of the wall is perpendicular and short and the heels high, a condition most often seen in the mule, especially the hind feet.

Lastly, knuckling is produced by disease of the suspensory ligament, or of the flexor tendons, whereby they are shortened, and by disease of the fetlock joints.

Treatment.—In young foals no treatment is necessary, unless there is some deformity present, since the legs straighten up without interference in the course of a few weeks' time. When knuckling has commenced the indications are to relieve the tendons and ligaments by proper shoeing. The foot is to be prepared for the shoe by shortening the toe as much as possible, leaving the heels high; or if the foot is prepared in the usual way the shoe should be thin in front, with thick heels or high calks. For the hind feet a long-heeled shoe with calks seems to do best. Of course, when possible, the causes of knuckling are to be removed, but since this can not always be done, the time may come when the patient can no longer perform any service, particularly in those cases where both forelegs are affected, and it becomes necessary either to destroy the animal or secure relief by surgical interference. In such cases the tendons, between the fetlock and knee, may

be divided for the purpose of securing temporary relief. Firing and blistering the parts responsible for the knuckling may, in some instances, effect a cure; but a consideration of these measures properly belongs to the treatment of the diseases in which knuckling simply appears as a sequel.

WIND-GALLS.

Joints and tendons are furnished with sacs containing a lubricating fluid called synovia. When these sacs are overdistended, by reason of an excessive secretion of synovia, they are called wind-galls. They form a soft, puffy tumor about the size of a hickory nut, and are most often found in the foreleg, at the upper part of the fetlock joint, between the tendon and the shin-bone. When they develop in the hind leg it is not unusual to see them reach the size of a walnut. Occasionally they appear in front of the fetlock on the border of the tendon. The majority of the horses are not subject to them after colthood is passed.

Causes.—Wind-galls are often seen in young, overgrown horses, where the body seems to have outgrown the ability of the joints to sustain the weight. In cart and other horses used to hard work, in trotters with excessive knee action, in hurdle racers and hunters, and in most cow-ponies there is a predisposition to wind-galls. Street-car horses and others used to start heavy loads on slippery streets are the ones most apt to develop wind-galls in the hind legs.

Symptoms.—The tumor is more or less firm and tense when the foot is on the ground, but is soft and compressible when the foot is off the ground. In old horses wind-galls generally develop slowly and cause no inconvenience. If they are caused by excessive tension of the joint the tumor develops rapidly, is tense, hot, and painful, and the animal is exceedingly lame. The patient stands with the joint flexed, walks with short steps, the toe only being placed on the ground. When the tumor is large and situated upon the inside of the leg it may be injured by interfering, causing stumbling and inflammation of the sac. Rest generally causes the tumor to diminish in size, only to fill up again after renewed labor. In old cases the tumors are hardened, and may become converted into bone by a deposit of the lime salts.

Treatment.—The large, puffy joints of suckling colts, as a rule, require no treatment, for as the animal grows older the parts clean up, and after a time the swelling entirely disappears.

When the trouble is due to an injury, entire rest is to be secured by the use of slings and a high-heeled shoe. Cold water douches should be used once or twice a day, followed by cold water bandages, until the fever has subsided and the soreness is largely removed, when a blister is to be applied.

In old wind-galls, which cause more or less stiffness, some relief may be had by the use of cold compress bandages, elastic boots, or the red

iodide of mercury blisters. Opening the sacs, as recommended by some authors, is of doubtful utility, and should only be adopted by the surgeon capable of treating the wound he has made. Enforced rest until complete recovery is effected should always be insisted on, as a too early return to work is sure to be followed by a relapse.

SPRAIN OF THE FETLOCK.

Sprain of the fetlock joint is most common in the fore legs, and as a rule affects but one at a time. Horses doing fast work, as trotters, runners, steeple-chasers, hunters, cow-ponies, and those that interfere, are particularly liable to this injury.

Causes.—Horses knuckling at the fetlock, and all those with diseases which impair the powers of locomotion, such as navicular disease, contracted heels, side bones, chronic laminitis, etc., are predisposed to sprains of the fetlock. It generally happens from a misstep, stumbling, or slipping, which results in the joint being extended or flexed to excess. The same result may happen where the foot is caught in a rut, hole in a bridge, or in a car track, and the animal falls or struggles violently. Direct blows and punctured wounds may also set up inflammation of the joint.

Symptoms.—The symptoms of sprain of the fetlock vary with the severity of the injury. If slight there may be no lameness, but simply a little soreness, especially when the foot strikes on uneven ground, and the joint is twisted a little. In cases more severe the joint swells, is hot and puffy, and the lameness may be so intense as to compel the animal to hobble on three legs. While at rest the leg is flexed at the joint affected, and the toe rests on the ground.

Treatment.—If the injury is slight, cold-water bandages and a few days' rest are sufficient to effect recovery. In cases where there is intense lameness, swelling, etc., the leg should be placed under a constant stream of cold water, as described in the treatment for quittor. When the inflammation has subsided a blister to the joint should be applied.

In some cases, especially in old horses long accustomed to fast work, the ligaments of the joints are ruptured, in whole or in part, and the lameness may last a long time. In these cases the joint should be kept completely at rest; and this condition is best secured by the application of the plaster of Paris bandages, as in cases of fracture. As a rule, patients take kindly to this bandage, and may be given the freedom of a roomy box or yard while wearing it. If they are disposed to tear it off, or if sufficient rest can not otherwise be secured, the patient must be kept in slings.

In the majority of instances the plaster bandage should remain on from two to four weeks. If the lameness returns when the bandage is removed, a new one should be put on. The swelling, which always remains after the other evidences of the disease have disappeared,

may be largely dissipated and the joint strengthened by the use of the firing iron and blisters.

A joint once injured by a severe sprain never entirely regains its original strength, and is ever after particularly liable to a repetition of the injury.

RUPTURE OF THE SUSPENSORY LIGAMENT.

Sprain, with or without rupture, of the suspensory ligament, may happen in both the fore and hind legs, and is occasionally seen in horses of all classes and at all ages. Old animals, however, and especially hunters, runners, and trotters, are the most subject to this injury, and with these classes the seat of the trouble is nearly always in one, or both, the fore legs. Horses used for heavy draught are more liable to have the ligament of the hind legs affected.

When the strain upon the suspensory ligament becomes too great one or both of the branches may be torn from their attachments to the sesamoid bones; one or both of the branches may be torn completely across; or the ligament may rupture above the point of division.

Symptoms.—The most common injury to the suspensory ligament is sprain of the internal branch in one of the fore legs. The trouble is proclaimed by lameness, heat, swelling and tenderness of the affected branch, beginning just above the sesamoid bone and extending obliquely downward and forward to the front of the ankle. If the whole ligament is involved the swelling comes on gradually, and is found above the fetlock and in front of the flexor tendons. The patient stands or walks upon the toe as much as possible, keeping the fetlock joint flexed so as to relieve the ligament of tension.

When both branches are torn from their attachments to the sesamoids, or both are torn across, the lameness comes on suddenly and is most intense; the fetlock descends, the toe turns up and, as the animal attempts to walk, the leg has the appearance of being broken off at the fetlock. These symptoms, followed by heat, pain, and swelling of the parts at the point of injury will enable any one to make a diagnosis.

Treatment.—Sprain of the suspensory ligament, no matter how mild it may be, should always be treated by enforced rest of at least a month, and the application of cold douches and cold water bandages, firmly applied until the fever has subsided, when a cantharides blister should be put on and repeated in two or three weeks' time, if necessary. When rupture has taken place the patient should be put in slings, and a constant stream of cold water allowed to trickle over the seat of injury until the fever is reduced. In the course of a week or ten days' time a plaster of Paris splint, such as is used in fractures, is to be applied and left on for a month or six weeks. When this is taken off blisters may be used to remove the remaining soreness; but it is useless to expect a removal of all the thickening, for in the process of repair new tissue has been formed which will always remain.

In old cases of sprain the firing iron may often be used with good results. As a rule, severe injuries to the suspensory ligament incapacitate the subject for anything but slow, light work.

OVERREACH.

An overreach is where the shoe of the hind foot strikes and injures the heel or quarter of the fore foot. It rarely happens except when the animal is going fast, hence is most common in trotting and running horses. In trotters the accident generally happens when the animal breaks from a trot to a run. The outside heels and quarters are most liable to the injury.

Symptoms.—The coronet at the heel or quarter is bruised or cut, the injury in some instances involving the horn as well. Where the hind foot strikes well back on the heel of the forefoot—an accident known among horsemen as "grabbing"—the shoe may be torn from the forefoot or the animal may fall to his knees. Horses accustomed to overreaching are often "bad breakers," for the reason that the pain of the injury so excites them that they can not readily be brought back to the trotting gait.

Treatment.—If the injury is but a slight bruise cold water bandages applied for a few days will remove all of the soreness. If the parts are deeply cut more or less suppuration will follow, and, as a rule, it is well to poultice the parts for a day or two, after which cold baths may be used, or the wounds dressed with tincture of aloes, oakum, and a roller bandage.

When an animal is known to be subject to overreaching, he should never be driven fast without quarter-boots, which are specially made for the protection of the heels and quarters.

If there is a disposition to "grab" the forward shoes, the trouble may be remedied by having the heels of these shoes made as short as possible, while the toe of the hind foot should project well over the hind shoe. When circumstances will permit of their use, the forefeet may be shod with the tips instead of the common shoe, as described in the treatment for contracted heels.

CALK WOUNDS.

Horses wearing shoes with sharp calks are liable to wounds of the coronary region, either from tramping on themselves, or on each other. These injuries are most common in heavy draught horses, especially on rough roads and slippery streets. The fore feet are more liable than the hind ones, and the seat of injury is commonly on the quarters. In the hind feet the wound often results from the animal resting with the heel of one foot set directly over the front of the other. In these cases the injury is generally close to the horn, and often involves the coronary band, the sensitive laminæ, the extensor tendon, and even the coffin bone.

Treatment.—Preventive measures would include the use of boots to protect the coronet of the hind foot, and the use of a blunt calk on the outside heel of the fore shoe, since this is generally the offending instrument where the fore feet are injured. If the wound is not deep and the soreness slight, cold-water bandages and a light protective dressing, such as carbolized cosmoline, will be all that is needed. Where the injury is deep, followed by inflammation and suppuration of the coronary band, lateral cartilages, sensitive laminæ, etc., active measures must be resorted to. In these cases cold, astringent baths, made by adding two ounces of sulphate of iron to a gallon of water, should be used, followed by poultices if it is necessary to hasten the cleansing of the wound by stimulating the sloughing process. Where the wound is deep between the horn and skin, especially over the anterior tendon, the horn should be cut away so that the injured tissues may be exposed. The subsequent treatment in these cases should follow the directions laid down in the article on toe-cracks.

FROST BITES.

Excepting the ears, the feet and legs are about the only parts of the horse liable to become frost bitten. The cases most commonly seen are found in cities, especially among car horses, where salt is used for the purpose of melting the snow on curves and switches. This mixture of snow and salt is splashed over the feet and legs, rapidly lowering the temperature of the parts to the freezing point. In mountainous districts where the snowfall is heavy and the cold often intense, frost bites are not uncommon even among animals running at large.

Symptoms.—When the frosting is slight the skin becomes pale and bloodless, followed soon after by intense redness, heat, pain, and swelling. In these cases the hair may fall out and the epidermis peel off, but the inflammation soon subsides, the swelling disappears, and only an increased sensitiveness to cold remains.

In cases more severe, irregular patches of skin are destroyed, and after a few days' time slough away, leaving slow-healing ulcers behind. In the cases produced by low temperatures and deep snow the coronary band is the part most often affected.

In many instances there is no destruction of the skin, but simply a temporary suspension of the horn-producing function of the coronary band. The fore feet are more often affected than the hind ones, and for some reason the heels and quarters are less often involved than the front part of the foot. The coronary band becomes hot, swollen and painful, and after two or three days' time the horn separates from the band and slight suppuration follows. For a few days the animal is lame, but as the suppuration disappears, the lameness subsides; new horn, often of an inferior quality, is produced by the coronary band, and in time the cleft is grown off and complete recovery is effected,

The frog is occasionally frost bitten and may slough off, exposing the soft tissues beneath and causing severe lameness for a time.

Treatment.—Simple frost bites are best treated by cold fomentations followed by applications of a 5 per cent. solution of carbolized oil. When portions of the skin are destroyed their early separation should be hastened by warm fomentations and poultices. Ulcers are to be treated by the application of stimulating dressings such as carbolized oil, a 1 per cent. solution of nitrate of silver or of chloride of zinc, with pads of oakum and flannel bandages. In many of these cases recovery is exceedingly slow. The new tissue by which the destroyed skin is replaced always shrinks in healing, and as a consequence unsightly scars are unavoidable. Where the coronary band is involved it is generally advisable to blister the coronet over the seat of injury as soon as the suppuration ceases, for the purpose of stimulating the growth of new horn. Where a crevasse is formed between the old and new horn, no serious trouble is likely to be met with until the cleft is nearly grown out, when the soft tissues may be exposed by a breaking off of the partly detached horn.

But even where this accident happens final recovery is secured by poulticing the foot until a sufficient growth of horn protects the part from injury.

QUITTOR.

Quittor is a term applied to various affections of the foot wherein the tissues which are involved undergo a process of degeneration that results in the formation of a slough, followed by the elimination of the diseased structures by means of a more or less extensive suppuration.

For convenience of consideration quittors may be divided into four classes, as suggested by Girard. (1) Cutaneons quittors, which is known also as simple quittor, skin quittor, and carbuncle of the coronet; (2) tendinous quittor; (3) subhorny quittor; and (4) cartilaginous quittor.

CUTANEOUS QUITTOR.

Simple quittor consists in a local inflammation of the skin and of the subcutaneous connective tissue on some part of the coronet, followed by a slough and the formation of an ulcer, which heals by suppuration.

It is an extremely painful disease, owing to the dense character of the tissues involved; for, in all dense structures, the swelling, which accompanies inflammation, always produces intense pressure. This pressure not only adds to the patient's suffering, but may, at the same time, endanger the life of the affected parts by strangulating the blood vessels, which alone constitute the means whereby a nutritive supply is constantly maintained. It is held by some writers on the subject that simple quittor is most often met with in the hind feet, but in the author's experience more than two-thirds of the cases have developed

in the fore feet. While any part of the coronet may become the seat of attack, the heels and quarters are undoubtedly most liable.

Causes.—Bruises and other wounds of the coronet are often the cause of cutaneous quittor, yet there can be no question but that in the great majority of these cases the disease develops without any known cause. For some reason, not yet satisfactorily explained, most cases happen in the fall of the year. One explanation of this fact has been attempted in the statement that the disease is due to the injurious action of cold and mud. This claim, however, seems to lose force when it is remembered that in many parts of this country the most mud, accompanied by freezing and thawing weather, is seen in the early springtime without a corresponding increase of quittor. Furthermore, the serious outbreaks of this disease in the mountainous regions of Colorado, Wyoming, and Montana are seen in the fall and winter seasons, when the weather is the driest. It may be claimed, and perhaps with justice, that during these seasons, when the water is low, animals are compelled to wade through more mud to drink from lakes and pools than is necessary at other seasons of the year, when these lakes and pools are full. Add to these conditions the further fact that much of this mud is impregnated with alkaline salts, which, like the mineral substances always found in the mud of cities, are more or less irritating, and it seems fair to conclude that under certain circumstances mud may become an important factor in the production of quittor.*

While this disease at times attacks any and all classes of horses, it is the large, common breeds, with thick skins, heavy coats, and coarse legs that are most often affected. Horses well groomed and cared for in stables seem to be less liable to the disease than those running at large or than those which are kept and worked under adverse circumstances.

Symptoms.—Lameness, lasting from one to three or four days, nearly always precedes the development of the strictly local evidences of quittor. The next sign is the appearance of a small, tense, hot, and painful tumor in the skin of the coronary region. If the skin of the affected foot is white the inflamed portion will present a dark red or even a purplish appearance near the center. Within a few hours' time

*A recent outbreak of quittor near Cheyenne, Wyo., which came under the author's observation, was caused by the mud through which the horses had to wade to reach the watering troughs. These troughs were furnished with water by windmills, and the mud-holes were caused by the waste water. More than fifty cases developed inside of two months' time or during September and October. Among these fifty cases all forms of the disease and all possible complications were presented. During the rainy season at Leadville, Colo., outbreaks of quittor are common, and the disease is so virulent that it has long been known as the "Leadville foot-rot." The soil being rich in mineral matters is no doubt the cause of the outbreaks. In the city of Montreal quittor is said to be very common in the early springtime, when the streets are muddy from the melting of the snow and ice.

the ankle, or even the whole leg as high as the knee or hock, becomes much swollen. The lameness is now so great that the patient refuses to use the foot at all, but carries it in the air if compelled to move. As a consequence the opposite leg is required to do the work of both, and if the animal persists in standing a greater part of the time it, too, becomes swollen. In many of these cases the suffering is so intense during the first few days as to cause general fever, dullness, loss of appetite, and increased thirst. Generally the tumor shows signs of suppuration within from forty-eight to seventy-two hours after its first appearance; the summit softens, a fluctuating fluid is felt beneath the skin, which soon ulcerates completely through, causing the discharge of a thick, yellow, bloody pus, containing shreds of dead tissue which have sloughed away. The sore is now converted into an open ulcer, generally deep, nearly or quite circular in outline, and with hardened base and edges. In exceptional cases large patches of skin, varying from 1 to 2½ inches in diameter, slough away at once, leaving an ugly superficial ulcer. These sores, especially when deep, suppurate freely; if there are no complications they tend to heal rapidly as soon as the degenerated tissue has softened and is entirely removed. When suppuration is fully established the lameness and general symptoms subside. Where but a single tumor and abscess form, the disease progresses rapidly and recovery, under proper treatment, may be effected in from two to three weeks' time; but when two or more tumors are developed at once or where the formation of one tumor is rapidly succeeded by another for an indefinite time the sufferings of the patient are greatly increased, the case is more difficult to treat, and recovery is more slow and less certain.

This form of quittor is often complicated with the tendinous and subhorny quittors by an extension of the sloughing process.

Treatment.—The first step in the treatment of an outbreak of quittor should be the removal of all exciting causes. Crowding animals into small corrals and stables, where injuries to the coronet are likely to happen from tramping, especially among unbroken range horses, must be avoided as much as possible.

Watering places, accessible without having to wade through mud, are to be supplied. In towns, where the mud or dust is largely impregnated with mineral products, it is not possible to adopt complete prophylactic measures. Much can be done, however, by careful cleansing of the feet and legs as soon as the animal returns from work. Warm water should be used to remove the mud and dirt, after which the parts are to be thoroughly dried with soft cloths.

The means which are to be adopted for the cure of cutaneous quittor vary with the stage of the disease at the time the case is presented for treatment. If the case is seen early, that is, before any of the signs of suppuration have developed, the affected foot is to be placed under a

constant stream of cold water, with the object of arresting a further extension of the inflammatory process. To accomplish this put the patient in slings in a narrow stall having a slat or open floor. Bandage the foot and leg to the knee or hock, as the case may be, with flannel bandages loosely applied. Set a tub or barrel filled with cold water above the patient and by the use of a small rubber hose of sufficient length make a siphon which will carry the water from the bottom of the tub to the leg at the top of the bandages. The stream of water should be quite small, and it is to be continued until the inflammation has entirely subsided or until the presence of pus can be detected in the tumor. When suppuration has commenced the process should be aided by the use of warm baths and poultices of linseed meal or boiled turnips. If the tumor is of rapid growth, accompanied by intense pain, relief is secured and sloughing largely limited by a free incision of the parts. The incision should be vertical and deep into the tumor, care being taken not to entirely divide the coronary band. If the tumor is large more than one incision may be necessary.

The foot should now be placed in a warm bath for half an hour or longer and then poulticed. The hemorrhage produced by the cutting and encouraged by the warm bath is generally very copious and soon gives relief to the overtension of the parts.

In other cases it will be found that suppuration is well under way, so that the center of the tumor is soft when the patient is first presented for treatment. It is always good surgery to relieve pus whenever its presence can be detected; hence in these cases a free incision must be made into the softened parts, the pus evacuated and the foot poulticed.

By surgical interference the tumor is now converted into an open sore or ulcer, which, after it has been well cleaned by warm baths and poultices applied for two or three days, needs to be protected by proper dressings. The best of all protective dressings is made of small balls or pledgets of oakum, carefully packed into the wound and held in place by a roller bandage 4 yards long, from 3 to 4 inches wide, made of common bedticking and skillfully applied. The remedies which may be used to stimulate the healing process are many, and as a rule they are applied in the form of solution or tinctures.

In my own practice I prefer a solution of bichloride of mercury 1 part, water 500 parts, with a few drops of muriatic acid or a few grains of muriate of ammonia added to cause the mercury to dissolve. The balls of oakum are wet with this solution before they are applied to the wound.

Among the other remedies which may be used, and perhaps with equally as good results, will be noted the sulphate of copper, iron, and zinc, 5 grains of either to the ounce of water; chloride of zinc, 5 grains to the ounce; carbolic acid, 20 drops dissolved in an equal amount of glycerine and added to one ounce of water, and the nitrate of silver, 10 grains to the ounce of water.

If the wound is slow to heal it will be found of advantage to change the remedies used every few days, for after a time a remedy seems to lose its stimulating effect upon the slow-growing granulations.

If the wound is pale in color, the granulations transparent and glistening, the tincture of aloes, tincture of gentian, or the spirits of camphor may do best.

When the sore is red in color and healing rapidly an ointment made of 1 part of carbolic acid to 40 parts of cosmoline or vaseline is all that is needed.

If the granulations continue to grow until a tumor is formed, which projects beyond the surrounding skin, it should be cut off with a sharp, clean knife, the foot poulticed for twenty-four hours, after which the wound is to be well cauterized daily with lunar caustic and the bandages applied with great firmness.

The question as to how often the dressings should be renewed must be determined by the condition of the wound, etc. If the sore is suppurating freely it will be necessary to renew the dressing every twenty-four or forty-eight hours. If the discharge is small in quantity and the patient comfortable the dressing may be left on for several days; in fact, the less often the wound is disturbed the better, in so long as the healing process is healthy. When the sore commences to skin over the edges should be lightly touched with the lunar caustic at each dressing. The patient may now be given a little exercise daily, but the bandages must be kept on until the wound is entirely healed.

TENDINOUS QUITTOR.

This form of quittor differs from the cutaneous in that it not only affects the skin and subcutaneous tissues, but involves, also, the tendons of the leg, the ligaments of the joints, and, in many cases, the bones of the foot as well.

Fortunately this form of quittor is less common than the preceding; yet any case beginning as simple cutaneous quittor may, at any time during its course, become complicated by the death of some part of the tendons by gangrene of the ligaments, sloughing of the coronary band, caries of the bones, or inflammation accompanied by suppuration of the synovial sacs and joints, thereby converting a simple quittor into one which will, in all probability, either destroy the patient's life or maim him for all time.

Causes.—Tendinous quittor is caused by the same injuries and influences that produce the simple form. Zundel believes it to be a not infrequent accompaniment of distemper. In my own experience I have seen nothing to verify this belief, but I am satisfied that young animals are more liable to have tendinous quittor than older ones, and that they are much more likely to make a good recovery.

Symptoms.—When a case of simple quittor is transformed into the tendinous variety the development of the complications is announced

by a sudden increase in the severity of all of the symptoms. On the other hand, if the attack primarily is one of tendinous quittor, the earliest symptom seen is a well-marked lameness in the affected leg. In those cases due to causes other than injuries this lameness is at first very slight, and the animal limps no more in trotting than in walking; but later on, generally during the next forty-eight hours, the lameness increases to such an extent that the patient often refuses to use the leg at all. An examination made during the first two days rarely discloses any cause for this lameness; it may not be possible even to say, with certainty, that the foot is the seat of the trouble. On the third or fourth day, sometimes so late as the fifth, a doughy-feeling tumor will be found forming on the heel or quarter. This tumor grows rapidly, feels hot to the touch, and is extremely painful. As the tumor develops all the other symptoms increase in intensity; the pulse is rapid and hard, the breathing quick, the temperature elevated three or four degrees, the appetite is gone, thirst is increased, and the lameness is so great that the foot is carried in the air if locomotion is attempted. At this stage of the disease the patient generally seeks relief by lying upon the broad side, with outstretched legs, the coat bedewed with a clammy sweat, while every respiration is accompanied by a moan. The leg soon swells to the fetlock; later this swelling gradually extends as as high as to the knee or hock, and in some cases it even reaches the body. As a rule several days elapse before the disease develops a well defined abscess, for, owing to the dense structure of the bones, ligaments and tendons, the suppurative process is a slow one, and the pus when formed is prevented from readily collecting in a mass.

Recently I made a *post mortem* examination on a typical case of this disease, where the animal had died on the fourth day after being found on the range slightly lame. The suffering had been intense; yet the only external evidences of the disease consisted in the shedding of the hoof from the right fore foot, and a limited swelling of the leg to the knee. The sloughing of the hoof took place two or three hours before death, and was accompanied with but little suppuration and no hemorrhage. The skin, from the knee to the foot, was thickened from watery infiltration (œdema), and on the inside quarter three holes, each about one-half of an inch in diameter, were found. All had ragged edges, while but one had gone deep enough to perforate the coronary band. The loose connective tissue, found beneath the skin, was distended with a gelatinous infiltration, over the whole course of the flexor tendons, and to the fetlock joint over the tendon in front. The soft tissues covering the coffin bone were loosened in patches by collections of pus which had formed beneath the sensitive laminæ. The coffin and pastern joints were both inflamed, as were also the coffin, navicular and coronet bones, while the outside toe of the coffin bone had become softened from suppuration, until it could readily be crumbled between the fingers. The coronary band was largely destroyed and completely sepa-

rated from the other tissues of the foot; the inner lateral cartilage was gangrenous, as was also a small spot on the extensor tendon, near its point of attachment on the coffin bone. Several small collections of pus were found deep in the connective tissue of the coronary region; along the course of the sesamoid ligaments; in the sheath of the flexor tendons; under the tendon just below the fetlock joint in front, and in the coffin joint.

But all cases of tendinous quittor are by no means so complicated as this one was. In rare instances the swelling is slight, and, after a few days' time the lameness and other symptoms subside without any discharge of pus from an external opening. In most cases, however, from one to half a dozen or more soft points arise on the skin of the coronet, open, and discharge slowly a thick, yellow, fetid, and bloody matter. In other cases the suppurative process is largely confined to the sensitive laminæ and plantar cushion; in these cases the suffering is intense until the pus finds an avenue of escape, which it generally does by separating the hoof from the coronary band, at or near the heels, without causing a loss of the whole horny box. When the flexor tendon is involved deep in the foot, the discharge of pus usually takes place from an opening in the hollow of the heel; if the sesamoid ligament, or the sheath of the flexors, are affected, the opening is nearer the fetlock joint; although in most of these cases the suppuration spreads along the course of the tendons until the navicular joint is involved, and extensive sloughing of the deeper parts follows.

Treatment.—The treatment of tendinous quittor is to be directed toward the saving of the foot. First of all, an effort must be made to prevent suppuration; and if the patient is seen at the beginning, the cold irrigation, recommended in the treatment for cutaneous quittor, is to be resorted to. Later on, when the tumor is forming on the coronet, the knife must be used, and a free and deep incision made into the swelling. Whenever openings appear from which the pus escapes they should be carefully probed; in all instances these fistulous tracts will be found leading down to dead tissue which nature is trying to remove by the process of sloughing. If a counter opening can be made, which will enable a more ready escape of the pus, it should be done at once; for instance, if the probe shows that the discharge originates from the bottom of the foot the sole must be pared through, over the seat of trouble. Whenever suppuration has commenced, the process is to be stimulated by the use of warm baths and poultices. The pus which accumulates in the deeper parts, especially along the tendons, around the joints and in the hoof, is to be removed by pressure and injections, made with a small syringe and repeated two or three times a day. As soon as the discharge assumes a healthy character and diminishes in quantity, stimulating solutions are to be injected into the open wounds. Where the tendons, ligaments, and other deeper parts are affected, a

strong solution of carbolic acid—1 to 4—should be used at first. Or, strong solutions of tincture of iodine, sulphate of iron, sulphate of copper, bichloride of mercury, etc., may be used in place of the carbolic; after which the remedies and dressings, directed for use in simple quittor, are to be used. In those cases where the fistulous tracts refuse to heal, it is often necessary to burn them out with a saturated solution of caustic soda, equal parts of muriatic acid and water, or, better still, with a long, thin iron, heated white hot.

But no matter what treatment is adopted, a large percentage of the cases of tendinous quittor fail to make good recoveries. Where the entire hoof sloughs away, the growth of a new, but soft and imperfect, hoof may be secured by carefully protecting the soft and exposed tissues with proper bandages. When the joints are opened by deep sloughing, recovery may eventually take place, but the joint remains immovable ever after. If caries of a small part of the coffin bone takes place, it may be removed by an operation; but if much of the bone is affected, or if the navicular and coronet bones are involved in the carious process, the only hope for a cure is in the amputation of the foot. Of course, this operation would only be advisable where the animal was valuable for breeding purposes. In all other cases where there is no hope for recovery the patient's suffering should be relieved by death. In tendinous quittor much thickening of the coronary region, and sometimes of the ankle and fetlock, remains after suppuration has ceased and the fistulous tracts have healed. To stimulate the reabsorption of this new and unnecessary tissue the parts should be fired with the hot iron; or, in its absence, repeated blistering, with the biniodide of mercury ointment, may largely accomplish the same result.

SUBHORNY QUITTOR.

This is the most common form of the disease. It is generally seen in but one foot at a time, and more often in the fore feet than in the hind ones. It nearly always attacks the inside quarter, but may affect the outside quarter, the toe or the heel, where it is but of little consequence. It consists in the inflammation of a small part of the coronary band and adjacent skin, followed by sloughing and more or less suppuration, which in most cases extends to the neighboring sensitive laminæ.

Causes.—Injuries to the coronet, such as bruises, overreaching, and calk wounds, are considered as the common causes of this disease. Still, cases occur in which there appears to be no exciting cause, just as in the other forms of quittor, and it seems fair to conclude that subhorny quittor may also be produced by internal causes.

Symptoms.—At the outset the lameness is always severe, and the patient often refuses to use the affected foot. Swelling of the coronet takes place close to the top of the hoof, causing the quarter to protrude beyond the wall of the foot. This tumor is extremely

sensitive, and the whole foot is hot and painful. After a few days' time a small spot in the skin, over the most elevated part of the tumor, softens and opens, or else the hoof separates from the coronary band at the quarter or well back toward the heel. From this opening, wherever it may be, a thin, watery, offensive discharge escapes, often dark in color, at times mixed with blood, and always containing a considerable percentage of pus.

Probing will now disclose a fistulous tract leading to the bottom of the diseased tissues. If the opening is small there is a tendency upon the part of the suppurative process to spread downward; the pus gradually separating the hoof from the sensitive laminæ until the sole is reached, and even a portion of this may also be undermined.

As a rule, the slough in this form of quittor is not deep, so that if the case receives early and proper treatment complications are generally avoided, but if the case is neglected, and, occasionally, even in spite of the best of treatment, the disease spreads until the tendon in front, the lateral cartilage, or the coffin bone and joint as well, are involved.

In all cases of subhorny quittor much relief is experienced as soon as the slough has come away, and rapid progress toward recovery is made. If, however, after the lapse of a few days' time, the lameness still remains and the wound continues to discharge a thin unhealthy matter, the probabilities are that the disease is spreading, and that pus is collecting in the deeper parts of the foot. In Zundel's opinion, if the use of the probe now detects a pus cavity below the opening, a cartilaginous quittor is in the course of development.

Treatment.—Hot baths and poultices are to be used until the presence of pus can be determined, when the tumor is to be opened with a knife or sharp-pointed iron heated white hot. The hot baths and poultices are now continued for a few days, or until the entire slough has come away and the discharge is diminished, when the dressings recommended in the treatment for cutaneous quittor are to be used until recovery is completed. In cases where the discharge comes from a cleft between the upper border of the hoof and the coronary band, always pare away the loosened horn, so that the soft tissues beneath are fully exposed, care being taken not to injure the healthy parts. This operation permits of a thorough inspection of the diseased parts, the easy removal of all gangrenous tissue, and a better application of the necessary remedies and dressings. The only objection to the operation is that the patient is prevented from being early returned to work.

When the probe shows that pus has collected under the coffin bone, the sole must be pared through, and if caries of the bone is present, the dead parts must be cut away. After either of these operations the wound is to be dressed with the oakum balls saturated in the bichloride of mercury solution, as previously directed, and the bandages tightly applied. Generally the discharge for the first two or three days is so great that the dressings need to be changed every twenty-four

hours; but when the discharge diminishes, the dressing may be left on from one to two weeks. Before the patient is returned to work, a bar shoe should be applied, since the removed quarter or heel can only be made perfect again by a new growth from the coronary band.

Tendinous or cartilaginous complications are to be treated as directed under these headings.

CARTILAGINOUS QUITTOR.

This form of quittor may commence as a primary inflammation of the lateral cartilage, but in the great majority of cases it appears as a sequel to cutaneous or sub-horny quittor. It may affect either the fore or hind feet, but is most commonly seen in the former. As a rule, it attacks but one foot at a time, and but one of the cartilages, and that is generally the inner one. It is always a serious affection for the reason that, in many cases, it can only be cured by a surgical operation, requiring a thorough knowledge of the anatomy of the parts involved and much surgical skill.

Causes.—Direct injuries to the coronet, such as tramping, pricks, burns, and the blow of some heavy falling object which may puncture, bruise, or crush the cartilage, are the common direct causes of cartilaginous quittor. Besides being a sequel to the other forms of quittor, it sometimes develops as a complication in suppurative corn, canker, grease, laminitis, and punctured wounds of the foot. Animals used for heavy draught, and those with flat feet and low heels, are more liable to the disease than others, for the simple reason that they are more exposed to injury. Rough roads also predispose to the disease by increasing liability to injury.

Symptoms.—When the disease commences as a primary inflammation of the cartilage, lameness develops with the formation of a swelling on the side of the coronet over the quarter. The severity of this lameness depends largely upon the part of the cartilage which is diseased; if the disease is situated in that part of the cartilage nearest the heel, where the surrounding tissues are soft and spongy, the lameness may be very slight, especially if the patient is required to go no faster than a walk; but when the middle and anterior parts of the cartilage are diseased the pain and consequent lameness are much greater, for the tissues are less elastic and the coffin joint is more likely to become affected.

Except in the cases to be noted hereafter, one or more fistulous openings finally appear in the tumor on the coronet. These openings are surrounded by a small mass of granulations, which are elevated above the adjacent skin and bleed readily if handled. A probe shows these fistulous tracts to be more or less sinuous, but always leading to one point—the gangrenous cartilage. When cartilaginous quittor happens as a complication of suppurative corn, or from punctured wounds of the foot, the fistulous tract may open alone at the point of injury on the sole.

The discharge in this form of quittor is generally thin, watery, and contains enough pus to give it a pale yellow color; it is offensive to the sense of smell, due to the detachment of small flakes of the cartilage which have become gangrenous and are are to be seen in the discharge in the form of small greenish-colored particles. In old cases it is not unusual to find some of the fistulous openings heal at the surface; this is followed by the gradual collection of pus in the deeper parts, forming an abscess, which in a short time opens at a new point. The wall of the hoof, over the affected quarter and heel, in very old cases, becomes rough and wrinkled like the horn of a ram; and generally it is thicker than the corresponding quarter, owing to the stimulating effect which the disease has upon the coronary band.

Complications may arise by an extension of the disease to the lateral ligament of the coffin joint, to the joint itself, to the plantar cushion, and by caries of the coffin bone.

Treatment.—Before recovery can take place in these cases all of the dead cartilage must be removed. In rare instances this is effected by nature without assistance. Usually, however, the disease does not tend to recovery, and active curative measures must be adopted. The best and simplest treatment in a majority of cases is the injection of strong caustic solutions, which are intended to destroy the diseased cartilage, and to cause its removal, along with the other products of suppuration. In favorable cases these injections will secure a healing of the wound in from two to three week's time. While the saturated solution of the sulphate of copper, or a solution of 10 parts of bi-chloride of mercury to 100 parts of water, has given the best results in my hands, equally as favorable success has been secured by others from the use of caustic soda, nitrate of silver, sulphate of zinc, tincture of iodine, etc. But no matter which one of these remedies may be selected, it must be used at least twice a day for a time. The solution is to be injected into the various openings with enough force to drive it to the bottom of the wound, after which the foot is to be dressed with a pad of oakum, held in place by a roller bandage tightly applied. While it is not always necessary, in many cases it is of advantage to relieve the pressure on the parts by rasping away the horn over the seat of the cartilage; the coronary band and the laminæ should not be injured in the operation.

If the caustic injections prove successful, the discharge will become healthy and gradually diminish, so that by the end of the second week it will be found that the fistulous tracts are closing up, and that the injections are made with much difficulty.

If, on the other hand, there is but little or no improvement after this treatment has been used for three weeks, it may reasonably be concluded that the operation for the removal of the lateral cartilage must be resorted to for the cure of the trouble. As this operation can be safely undertaken only by an expert surgeon, it will not be described in this connection.

THRUSH.

Thrush is a disease characterized by an excessive secretion of unhealthy matter from the cleft of the frog. While all classes of horses are liable to this affection, it is more often seen in the common draft horse than in any other breed, a fact due to the conditions of servitude and not to the fault of the breed. Country horses are much less subject to the disease, except in wet, marshy districts, than are the horses used in cities and towns.

Causes.—The most common cause of thrush is the filthy condition of the stable in which the animal is kept. Mares are more liable to contract the disease in the hind feet when the cause is due to filth, while the gelding and stallion are more likely to develop it in the fore feet. Hard work, on rough and stony roads, may also induce the disease, as may a change from dryness to excessive moisture. The latter cause is often seen to operate in old track horses, whose feet are constantly soaked in the bath-tub for the purpose of relieving soreness. Muddy streets and roads, especially where mineral substances are plentiful, excite this abnormal condition of the frog. Contracted heels, scratches, and navicular disease predispose to thrush, while by some a constitutional tendency is believed to exist among certain animals which otherwise present a perfect frog.

Symptoms.—At first there is simply an increased moisture in the cleft of the frog, accompanied by an offensive smell. After a time a considerable discharge takes place—thin, watery, and highly offensive—changing gradually to a thicker puriform matter, which rapidly destroys the horn of the frog. Only in old and severe cases is the patient lame and the foot feverish,—cases in which the whole frog is involved in the diseased process.

Treatment.—Thrushes are to be treated by cleanliness, the removal of all exciting causes, and a return of the frog to its normal condition. As a rule, the diseased and ragged portions of horn are to be pared away, and the foot poulticed for a day or two with boiled turnips, to which may be added a few drops of carbolic acid or a handful of powdered charcoal to destroy the offensive smell. The cleft of the frog and the grooves on the edges are then to be cleaned and well filled with dry calomel, and the foot dressed with oakum and a roller bandage. If the discharge is profuse the dressing should be changed daily, otherwise it may be left on for two or three days at a time. Where a constitutional taint is supposed to exist with swelling of the legs, grease, etc., a purgative followed by dram doses of sulphate of iron, repeated daily, may be prescribed. In cases where the growth of horn seems too slow, a Spanish fly blister applied to the heels is often followed by good results. Feet in which the disease is readily induced may be protected in the stable with a leather boot. If the thrush is but a sequel to other diseases a permanent cure may not be possible.

CANKER.

Canker of the foot is a disease due to the rapid reproduction of a vegetable parasite. It not only destroys the sole and frog, but by setting up a chronic inflammation in the deeper tissues, prevents the growth of a healthy horn by which the injury might be repaired. Heavy cart horses are more often affected than those of any other class.

Causes.—The essential element in the production of cankers is of course the presence of the parasite; consequently the disease may be called contagious. But, as in all other diseases due to specific causes, the seeds of the disorder must find a suitable soil in which to grow before they are reproduced. It may be said, then, that the conditions which favor the preparation of the tissues for a reception of the seeds of this disease are simply predisposing causes.

The condition most favorable to the development of cankers is dampness—in fact, dampness seems indispensable to the existence and growth of the parasite; for the disease is rarely, if ever, seen in high, dry districts, and is much more common in rainy than in dry seasons. Filthy stables and muddy roads have been classed among the causes of canker; but it is very doubtful if these conditions can do more than favor a preparation of the foot for the reception of the disease germ.

All injuries to the feet may, by exposing the soft tissues, render the animal susceptible to infection; but neither the injury nor the irritation and inflammation of the tissues which follow, are sufficient to induce the disease.

For some unknown reason horses with lymphatic temperaments, thick skins, flat feet, fleshy frogs, heavy hair, and particularly with white feet and legs, are especially liable to canker.

Symptoms.—Usually, canker is confined to one foot; but it may attack two, three, or all of the feet at once; or, as is more commonly seen, the disease attacks first one then another, until all may have been successively affected. When the disease follows an injury which has exposed the soft tissues of the foot the wound shows no tendency to heal, but, instead, there is secreted from the inflamed parts a profuse, thin, fetid, watery discharge, which gradually undermines and destroys the surrounding horn, until eventually a large part of the sole and frog is diseased. The living tissues are swollen, dark-colored, and covered at certain points with particles of new, soft, yellowish, thready horn, which are constantly undergoing maceration in the abundant liquid secretion by which they are immersed. As this secretion escapes to the surrounding parts it dries and forms small cheesy masses composed of the partly dried horny matter, exceedingly offensive to the sense of smell. When the disease originates independently of an injury, the first evidences of the trouble are the offensive odor of the foot, the liquid secretion from the cleft and sides of the frog, and the rotting away of the horn of the frog and sole.

In the earlier stages of the disease there is no interference with locol motion, but later the foot becomes sensitive, particularly if the anima- is used on rough roads, and, finally, when the sole and frog are largely destroyed the lameness is severe.

Treatment.—Since canker does not destroy the power of the tissues to produce horn, but rather excites them to an excessive production of an imperfect horn, the indications for treatment are to restore the parts to a normal condition when healthy horn may again be secreted. In my experience, limited though it has been, the old practice of stripping off the entire sole and deep cauterization, with either the hot iron or strong acids, is not attended with uniformly good results.

I am of the opinion that recovery can generally be effected as surely and as speedily with measures which are less heroic and much less painful. True, the treatment of canker is likely to exhaust the patience, and sometimes the resources, of the attendant; but after all success depends more on the persistent application of simple remedies and great cleanliness than on the special virtues of any particular drug.

First, then, clean the foot with warm baths, and apply a poultice containing powdered charcoal or carbolic acid. A handful of the char- coal, or a tablespoonful of the acid, mixed with the poultice serves to destroy much of the offensive odor. The diseased portions of horn are now to be carefully removed with sharp instruments, until only healthy horn borders the affected parts. The edges of the sound horn are to be pared thin, so that the swollen soft tissues may not overlap their borders. With sharp scissors cut off all the prominent points on the soft tissues, shorten the walls of the foot, and nail on a broad, plain shoe. The foot is now ready for the dressings, and any of the many stimulating and drying remedies may be used. Whichever is selected at the outset, it will be necessary to change frequently from one to another, until finally all may be tried.

The list from which a selection may be made comprises wood tar, gas tar, petroleum, creosote, phenic acid, sulphates of iron, copper and zinc, chloride of zinc, bichloride of mercury, calomel, caustic soda, nitrate of silver, chloride of lime, carbolic, nitric, and sulphuric acids.

In practice I prefer to give the newly shod foot a bath for an hour or two in a solution of the sulphate of iron, made by adding 2 ounces of the powdered sulphate to a gallon of cold water. When the foot is removed it is dressed with oakum balls, dipped in a mixture made of Barbadoes tar, 1 part; oil of turpentine, 8 parts, to which are slowly added 2 parts of sulphuric acid, and the mixture well stirred and cooled. The diseased parts being well covered with the balls, a pad of oakum, sufficiently thick to cause considerable pressure, is placed over them, and all are held in place by pieces of heavy tin fitted to slip under the shoe. The whole foot is now encased in a boot or folded gunny sack, and the patient turned into a loose, dry box. The dressings are to be changed daily, or even twice a day, at first. When they are removed all pieces of new

horny matter, which are not firmly adherent must be rubbed off with the finger or a tent of oakum. As the secretion diminishes dry powders may prove of most advantage, such as calomel, sulphates of iron, copper, etc. The sulphates should not be used pure, but are to be mixed with powdered animal charcoal in the proportion of one of the former to eight or ten of the latter. When the soft tissues are all horned over the dressings should be continued for a time, weak solutions being used to prevent a recurrence of the disease. If the patient is run down in condition, bitter tonics, such as gentian, may be given in 2-dram doses, twice a day, and a liberal diet of grain allowed.

CORNS

A corn is an injury to the living horn of the foot, involving at the same time the soft tissues beneath, whereby the capillary blood vessels are ruptured and a small amount of blood escapes, which, by permeating the horn in the immediate neighborhood, stains it a dark color. If the injury is continuously repeated the horn becomes altered in character, the soft tissues may suppurate, causing the disease to spread, or a horny tumor may develop. Corns always appear in that part of the sole included in the angle between the bar and the outside wall of the hoof. In many cases the laminæ of the bar, of the wall, or of both, are involved at the same time.

Three kinds of corns are commonly recognized—the dry, the moist, and the suppurative, a division based solely on the character of the conditions which follow the primary injury.

The forefeet are almost exclusively the subjects of the disease, for two reasons: First, because they support a greater part of the body; secondly, because the heel of the fore foot during progression is first placed upon the ground, whereby it receives much more concussion than the heel of the hind foot, in which the toe first strikes the ground.

Causes.—It may be said that all feet are exposed to corns, and that even the best feet may suffer from them when the conditions necessary to the production of the peculiar injury are present. The heavier breeds of horses generally used for heavy work on rough roads and streets seem to be most liable to this trouble. Mules rarely have corns.

Among the causes and conditions which predispose to corns may be named high heels, which change the natural relative position of the bones of the foot and thereby increase the concussion to which these parts are subject; contracted heels, which in part destroy the elasticity of the foot, increase the pressure upon the soft tissues of the heel, and render lacerations more easy; long feet, which, by removing the frog and heels too far from the ground, deprive them of necessary moisture, which in turn reduces the elastic properties of the horn and diminishes the transverse diameter of the heels; weak feet, or those in which the horn of the wall is too thin to resist the tendency to spread, and as a result the soft tissues are easily lacerated. Wide feet with low heels are always accom-

panied by a flat sole whose posterior wings either rest upon the ground or the shoe, and as a consequence are easily bruised; at the same time the arch of the sole is so broad and flat that it can not support the weight of the body, and in the displacement which happens when the foot is rested upon the ground the soft tissues are liable to become bruised or torn.

It is universally conceded that shoeing of the foot, either as a direct or predisposing cause, is most prolific in producing corns. One of the most serious as well as the most common of the errors in shoeing is to be found in the preparation of the foot for the shoe. Instead of seeking to maintain the integrity of the arch the first thing done is to weaken it by freely paring away the sole; nor does the mutilation end here, for the frog, which is nature's main support to the branches of the sole and the heels, is also largely cut away. This not only permits of an excessive downward movement of the contents of the horny box, but it at the same time removes the one great means by which concussion of the foot is destroyed. As adjuncts to the foregoing errors must be added the faults in the construction of the shoe and in the way it is adjusted to the foot. An excess of concavity in the shoe, by extending it too far back on the heels, high calks, thin heels which permit the shoe to spring, short heels with a calk set under the foot, and a shoe too light for the animal wearing it or for the work required of him, are all to be avoided as causes of corns. A shoe so set as to press upon the sole, or one that has been on so long that the hoof has overgrown it until the heels rest upon the sole and bars, becomes a direct cause of corns. Indirectly the shoe becomes the cause of corns when small stones, hard dry earth, or other objects collect between the sole and shoe. Lastly, a rapid gait and excessive knee action, especially on hard roads, predispose to this disease of the feet.

Symptoms.—Ordinarily a corn induces sufficient pain to cause lameness. It may be intense, as seen in suppurative corn, or it may be but a slight soreness, such as that which accompanies dry corn. It is by no means unusual to see old horses having chronic corns apparently so accustomed to the slight pain which they suffer as not to limp at all; but these animals are generally very restless; they paw their bedding behind them at night, and in many instances they refuse to lie down for any lengthened rest. The lameness of this disease, however, can hardly be said to be characteristic, for the reason that it varies so greatly in intensity; but the position of the leg while the patient is at rest is generally the same in all cases. The foot is so advanced that it is relieved of all weight and the fetlock is flexed until all pressure by the contents of the hoof is removed from the heels. In suppurative corn the lameness subsides or entirely disappears as soon as the abscess has opened. When the injured tissues are much inflamed, as may happen in severe and recent cases, the heel of the affected side, or even the whole foot, is hot and tender to pressure. In dry corn, and in most chronic

cases, all evidences of local fever are often wanting. It is in these cases that the patient goes well when newly shod, for the smith cuts away the sole over the seat of injury until all pressure by the shoe is removed, and lowers the heels so that concussion is reduced to a minimum. If a corn is suspected the foot should be examined for increased sensibility of the inside heel. Tapping the heel of the shoe with a hammer and grasping the wall and bar between the jaws of a pincers, with moderate pressure, will cause more or less flinching if the disease is present. For further evidence the shoe is removed and the heel cut away with the drawing knife. As the horn is pared out not only the sole in the angle is found discolored, but, in many instances, this insensible laminæ of the bar and wall adjacent are also stained with the escaped blood. In moist and suppurative corns this discoloration is less marked than in dry corn and may even be entirely wanting. In these cases the horn is soft, often white, and stringy or mealy, as seen in punniced sole resulting from founder. When the whole thickness of the sole is discolored and the horn dry and brittle it is generally evidence that the corn is an old one and that the exciting cause has existed continuously. A moist corn differs from the dry corn in that the injury is more severe, the parts affected are more or less inflamed, and the horn of the sole in the angle is undermined by a citron-colored fluid, which often permeates the injured sole and laminæ, causing the horn to become somewhat spongy.

A suppurative corn differs from the others in that the inflammation accompanying the injury ends in suppuration. The pus collects at the point of injury and finally escapes by working a passage way between the sensitive and insensible laminæ to the top of the hoof, where an opening is made by separation of the wall from the coronary band at or near the heels. This is the most serious form of corns, for the reason that it may induce gangrene of the plantar cushion, cartilaginous quittor, or caries of the coffin bone.

Treatment.—Since a diversity of opinion exists as to what measures must be adopted for the radical cure of corns, the author will advise the use of those which have proven most efficient in his hands.

As in all other troubles, the cause must be discovered, if possible, and removed. In the great majority of cases the shoeing will be at fault. While sudden changes in the method of shoeing are not advisable, it may be said that all errors, either in the preparation of the foot, in the construction of the shoe, or in its application, may very properly be corrected at any time. Circumstances may, at times, make it imperative that shoes shall be worn which are not free from objections, as, for instance, the shoe with a high calk; but in such cases it is considered that the injuries liable to result from the use of calks are less serious than those which are sure to happen for the want of them.

For a sound foot, perfectly formed, a flat shoe, with heels less thick than the toe, and which rests evenly on the wall proper, is the best.

In flat feet it is often necessary to concave the shoe as much as possible on the upper surface, so that the sole may not be pressed upon. If the heels are very low the heels of the shoe may be made thicker. If the foot is very broad and the wall light toward the heels, a bar shoe, resting upon the frog, will aid to prevent excessive tension upon the soft tissues when the foot receives the weight of the body. A piece of leather placed between the foot and the shoe serves to largely destroy concussion, and its use is absolutely necessary on some animals in that they may be kept at work.

Lastly, among the preventive measures, may be mentioned those which serve to maintain the suppleness of the hoof. The dead horn upon the surface of the sole not only retains moisture for a long time, but protects the living horn beneath from the effects of evaporation, and for this reason the sole should be pared as little as possible. Stuffing the feet with flaxseed meal, wet clay, or other like substances; damp dirt floors or damp bedding of tan-bark, greasy hoof ointments, etc., are all means which may be used to keep the feet from becoming too dry and hard.

As to the curative measures which are to be adopted much will depend upon the extent of the injury. If the case is one of chronic dry corn, with but slight lameness, the foot should be poulticed for a day or two and the discolored horn pared out, care being taken not to injure the soft tissues. The heel on the affected side is to be lowered until all pressure is removed, and, if the patient's labor is required, the foot must be shod with a bar shoe or with one having stiff heels. Care must be taken to reset the shoe before the foot has grown too long, else the shoe will no longer rest on the wall but on the sole and bar.

In moist corns we believe in cutting them out. If there is inflammation present, cold baths and poultices should be used; when the horn is well softened and the fever allayed, pare out all of the diseased horn, lightly cauterize the soft tissues beneath, and poultice the foot for two or three days. When the granulations look red dress the wound with oakum balls saturated in a weak solution of tincture of aloes or spirits of camphor, and apply a roller bandage. Change the dressing every two or three days until a firm, healthy layer of new horn covers the wound, when the shoe may be put on, as in dry corn, and the patient returned to work.

In suppurative corns the loosened horn must be removed so that the pus may freely escape. If the pus has worked a passage to the coronary band, and escapes from an opening between the band and hoof, an opening must be made on the sole, and cold baths, made astringent with a little sulphate of iron or copper, are to be used for a day or two. When the discharge becomes healthy the fistulous tracts may be injected daily with a weak solution of bichloride of mercury, nitrate of silver, etc., and the foot dressed as after the operation for moist corns. When complications arise the treatment must be varied to meet the.

indications; if gangrene of the lateral cartilage takes place it must be treated as directed under the head of cartilaginous quittor; if the velvety tissue is gangrenous it must be cut away, and if the coffin bone is necrosed it must be scraped, and the resulting wounds are to be treated on general principles. After any of the operations for corns have been performed, in which the soft tissues have been laid bare, it is best to protect the foot by a sole of soft leather, set beneath the shoe, when the animal is returned to work. Only in rare instances are the complications of corn so serious as to destroy the life or usefulness of the patient. It is the wide, flat foot, with low heels and a thin wall, which is most liable to resist all efforts toward effecting a complete cure.

BRUISE OF THE FROG.

When the frog is severely bruised the injury is followed by suppuration beneath the horn, and at times by partial gangrene of the plantar cushion.

Causes.—A bruise of the frog generally happens from the animal stepping on a rough stone or other hard object. It is more apt to take place when the animal is trotting, running, or jumping than when he is at a slower pace. A stone wedged between the branches of the shoe in the cleft of the frog, or between the sides of the frog and the shoe, and remaining for a time, produces the same results. A cut through the horny frog with some sharp instrument or a punctured wound with a blunt pointed instrument may also cause suppuration and gangrene of the plantar cushion. Broad, flat feet, with low heels and a fleshy frog, are most liable to these injuries.

Symptoms.—Lameness, severe in proportion to the extent of the bruise and the consequent suppuration, is always an early symptom. When the animal moves the toe only is placed to the ground, or the foot is carried in the air and the patient hobbles along on three legs. When he is at rest the foot is set forward with the toe resting on the ground and the leg flexed at the fetlock joint. As soon as the pus finds its way to the surface the lameness improves. If the frog is examined early the injured spot may usually be found, and if no opening exists the collection of pus may be detected working its way toward the heels. The horn is felt to be loosened from the deeper tissues, and if it is pared through, a thin, yellow, watery and offensive pus escapes. In other cases a ragged opening is found in the frog, leading down to a mass of dead, sloughing tissues, which are pale green in color if gangrene of the plantar cushion has set in. In rare cases the coffin bone may be involved in the injury and a small portion of it become carious.

Treatment.—If the injury is seen at once the foot should be placed in a bath of cold water with the object of preventing suppuration. If suppuration has already set in the horn of the frog, and of the bars and branches of the sole if necessary, is to be pared thin, so that all possible pressure may be removed and the foot poulticed. As soon as

the pus has loosened the horn, all the detached portions are to be cut away. If the pus is discharging from an opening near the hair the whole frog, or one-half of it will generally be found separated from the plantar cushion, and is to be removed with the knife. After a few days' time the gangrenous portion of the cushion will slough off under the stimulating effects of the poultice, and under rare circumstances only should the dead parts be removed by surgical interference. Where the slough is all detached the remaining wound is to be treated with simple stimulating dressings, such as tincture of aloes or turpentine, oakum balls, and bandages as directed in punctured wounds. The lameness having subsided, and a thin layer of new horn having grown on the exposed parts, the foot may be shod, the frog covered with a thick pad of oakum, held in place by pieces of tin fitted to slide under the shoe, and the animal returned to slow work. Where caries of the coffin bone, etc., follow the injury the treatment recommended for these complications in punctured wounds of the foot must be resorted to.

PUNCTURED WOUNDS OF THE FOOT.

Of all the injuries to which the foot of the horse is liable none are more common than punctured wounds, and none are more serious than these may be when involving the more important organs contained within the hoof. A nail is the most common instrument by which the injury is inflicted, yet wounds may happen from sharp pieces of rock, glass, wire, knives, etc.

A wound of the foot is more serious when made by a blunt-pointed instrument than when the point is sharp, and the nearer the injury is to the center of the foot the more likely are disastrous results to follow. Wounds in the heels and in the posterior parts of the frog are attended with but little danger, unless they are so deep as to injure the lateral cartilages, when quittor may follow. Punctured wounds of the anterior parts of the sole are more dangerous for the reason that the coffin bone may be injured and the suppuration, even where the wound is not deep, tends to spread and always gives rise to intense suffering. The most serious of the punctured wounds are those which happen to the center of the foot, and which involve, in proportion to their depth, the plantar cushion, the plantar aponeurosis, the sesamoid sheath, the navicular bone, or the coffin joint.

Punctured wounds are more likely to be deep in flat or convex feet than in well-made feet, and, as a rule, recovery is neither so rapid nor so certain. These wounds are less serious in animals used for heavy draught than in those required to do faster work; for the former may be useful, even if complete recovery is not effected. Lastly, punctured wounds of the fore feet are more serious than of the hind feet, for the reason that in the former the instrument is apt to enter the foot in a nearly perpendicular line, and, consequently, is more likely to injure

the deeper structures of the foot, while in the hind foot the injury is generally near the heels and the wound oblique and less deep.

Symptoms.—A nail or other sharp instrument may penetrate the frog and remain there for several days without causing lameness; in fact, in many cases of punctured wound of the frog, the first evidence of the injury is the finding of the nail on cleaning the foot or the appearance of an opening where the skin and frog unite from which more or less pus escapes. Even when the sole is perforated, if the injury is not too deep, no lameness develops until suppuration is established. In all cases of foot lameness, especially if the cause is obscure, the foot should be examined for evidences of injury.

The lameness from punctured wounds, accompanied by suppuration, is generally severe, the patient often refusing to use the affected member at all. The pain being lancinating in character, he stands with the injured foot at rest or constantly moves it back and forth. In other cases the patient lies down most of the time with the feet outstretched; the breathing is rapid, the pulse fast, the temperature elevated, and the body covered with patches of sweat.

When the plantar aponeurosis is injured the pus escapes with difficulty and the wound shows no signs of healing; the whole foot is hot and very painful. If the puncture involves the sesamoid sheath the synovial fluid escapes. At first this fluid is pure, like joint-water, but later on it becomes mixed with the products of suppuration and loses its clear amber color. In these cases the suppuration generally extends up the course of the flexor tendon, an abscess forms in the hollow of the heel, and finally opens somewhere below the fetlock joint. The whole coronet is more or less swollen, the discharge is profuse and often mixed with blood, yet the suffering is greatly relieved from the moment the abscess opens.

When the wound reaches the navicular bone the lameness is intense from the beginning; but after all the only certain way in which to determine the existence of this complication is in the use of the probe, and unless there is a free escape of synovia the probe should be used with the greatest of care, else the coffin joint may be opened.

If the coffin-joint has been penetrated, either by the offending instrument or by the process of suppuration, acute inflammation of the joint follows, accompanied by high fever, loss of appetite, etc. The ankle and coronet are now greatly swollen, and in many cases dropsy of the leg to the knee or hock, or even to the body, follows. If the process of suppuration continues small abscesses appear at intervals on different parts of the coronet, the patient rapidly loses flesh, and may die from the effects of the intense suffering and blood poisoning. In other cases the suppuration soon disappears and recovery is effected by the joint becoming stiff (anchylosis).

When the wound is forward, near the toe, and deep enough to injure the coffin bone, caries always results. The presence of the dead pieces

of bone can be determined by the use of the probe; the bone feels rough and gritty. Furthermore, there is no disposition upon the part of the wound to heal.

Besides the complications above mentioned others, equally as serious, may be met with. The tendons may soften and rupture, the hoof may slough off, quittors develop, or sidebones and ringbones grow. Finally laminitis of the opposite foot may happen if the patient persists in standing most of the time, or lockjaw may cause early death.

Treatment.—In all cases of punctured wound of the foot the horn around the seat of injury should be thinned down, a free opening made for the escape of the products of suppuration, and the foot placed in a poultice. If the injury is not serious recovery takes place in a few days' time. Where the wound is deeper it is better to put the foot in a cold bath or under a stream of cold water, as advised in the treatment for quittor.

If the bone is injured cold baths, containing about 2 ounces each of sulphate of copper and sulphate of iron, may be used until the dead bone is well softened, when it should be removed by an operation. The animal must be cast for this operation, the sole pared away until the diseased bone is exposed, when all the dead particles are to be removed with a drawing-knife and the wound dressed with a 5 per cent. solution of carbolic acid, oakum balls, and a roller bandage.

Wounds of the bone which are made by a blunt-pointed instrument, like the square-pointed cut nail, in which a portion of the surface is driven into the deeper parts of the bone, always progress slowly, and should be operated upon as soon as the conditions are favorable. Even wounds of the navicular bone, accompanied by caries, may be operated on and the life of the patient saved; but the most skillful surgery is required in these cases and only the experienced operator should undertake their treatment.

If there is an escape of pure synovial fluid from a wound of the sole, without injury to the bone, a small pencil of corrosive sublimate should be introduced to the bottom of the wound and the foot dressed as directed above.

The other complications are to be treated as directed under their proper headings.

After healing of the wounds has been effected, lameness, with more or less swelling of the coronary region, may remain. In these cases the coronet should be blistered, or even fired with the actual cautery, and the patient turned to pasture. If the lameness still persists, and is not due to a stiff joint, unnerving may be resorted to, and in many cases with very good results. If the joint is anchylosed of course no treatment can relieve it, and the patient must either be put to very slow work or kept for breeding purposes only.

"*Prick in shoeing*" is an injury which should be considered under the head of punctured wounds of the foot. The nails by which the

shoe is fastened to the hoof may produce an injury followed by inflammation and suppuration in two days, either by penetrating the soft tissues directly or by being driven so deep that the inner layers of the horn of the wall are pressed against the soft tissues with such force as to crush them. In either case the animal generally goes lame soon after shoeing unless the injury is at the toe, when the first evidence of the trouble may be the discharge of pus at the coronet. When lameness follows close upon the setting of the shoes, without other appreciable cause, each nail should be lightly struck with a hammer when the one at fault will be detected by the flinching of the animal.

The treatment consists in drawing the nail, and if the soft tissues have been penetrated, or if suppuration has commenced the horn must be pared away until the diseased parts are exposed. The foot is now to be poulticed for a day or two, or until the lameness and suppuration have ceased. If the discharge of pus from the coronet is the first evidence of the disease the offending nail must be found and removed, the parts pared out, and a weak solution of carbolic acid injected at the coronet until the fistulous tract has healed.

CONTRACTED HEELS.

Contracted heels, or hoof-bound as it is sometimes called, is a common disease, especially among horses kept on hard floors in dry stables, and in such as are subject to much saddle work. It consists in an atrophy or shrinking of the tissues of the foot, whereby the lateral diameter of the heels in particular is diminished. It affects the fore feet principally, but is seen occasionally in the hind feet, where it is of less importance for the reason that the hind foot first strikes the ground with the toe, and, consequently, less expansion of the heels is necessary than in the fore feet where the weight is first received on the heels, and any interference with the expansibility of this part of the foot interferes with locomotion and ultimately gives rise to lameness. Usually but one foot is affected at a time, but when both are diseased the change is greater in one than in the other. Occasionally but one heel, and that the inner one, is contracted; in these cases there is less likely to be lameness and permanent impairment of the animal's usefulness. According to the opinion of some of the French veterinarians, hoof-bound should be divided into two classes—*total contraction*, in which the whole foot is shrunken in size, and *contraction of the heels*, when the trouble extends only from the quarters backward. (Plate XXXIV, Figs 4 and 7.)

Causes.—Animals raised in wet or marshy districts, when taken to towns and kept on dry floors, are liable to have contracted heels, not alone because the horn becomes dry but because fever of the feet and wasting away of the soft tissues result from the change. Another common cause of contracted heels is to be found in faulty shoeing, such as rasping the wall, cutting away the frog, heels, and bars; high calks and the use of nails too near the heels. Contracted heels may happen also

as one of the results of other diseases of the foot; for instance, it often accompanies thrush, side bones, ring bones, canker, navicular disease, corns, sprains of the flexor tendons, of the sesamoid and suspensory ligaments, and from excessive knuckling of the fetlock joints.

Symptoms.—In contraction of the heels the foot has lost its circular shape, and the walls from the quarters backward approach to a straight line. The ground surface of the foot is now smaller than the coronary circumference; the frog is pinched between the inclosing heels, is much shrunken, and at times is affected with thrush. The sole is more concave than natural, the heels are higher, and the bars are long and nearly perpendicular. The whole hoof is dry, and so hard that it can scarcely be cut; the parts toward the heels are scaly and often ridged like the horns of a ram, while fissures, more or less deep, may be seen at the quarters and heels following the direction of the horn fibers. (Plate XXXIII, Fig. 10.) When the disease is well advanced lameness is present; in the earlier stages there is only an uneasiness evinced by frequent shifting of the affected foot or feet. Stumbling is common, especially on hard or rough roads. In most cases the animal comes out of the stable stiff and inclined to walk on the toe, but after exercise he may go free again. He wears his shoes off at the toe in a short time, no matter whether he works or remains in the stable. If the shoe is removed and the foot pared, in old cases a dry, mealy horn will be found where the sole and wall unite, extending upward in a narrow line toward the quarters.

Treatment.—First of all, the preventive measures must be considered. The feet must be kept moist and the horn be prevented from drying out by the use of moist sawdust or other damp bedding; by occasional poultices of boiled turnips, linseed meal, etc., and the use of greasy hoof ointments to both the sole and walls of the feet. The wall of the foot should be spared from the abuse of the rasp; the frog, heels, and bars are not to be mutilated with the knife, nor should calks be used on the shoe except when absolutely necessary. The shoes should be reset at least once a month, to prevent the feet from becoming too long, and daily exercise must be insisted on.

As to curative measures a diversity of opinion exists. A number of kinds of special shoes have been invented, having for an object the spreading of the heels, and perhaps any of these, if properly used, would eventually effect the desired result. But a serious objection to most of these shoes is that they are expensive and often difficult of make and application. The method of treatment which I have adopted in these cases is not only attended with good results, but is inexpensive, if the loss of the patient's services for a time is not considered a part of the question. It consists, first, in the use of poultices or baths of cold water for a few days until the horn is thoroughly softened. The foot is now prepared for the shoe in the usual way, except that the heels are lowered a little, the frog remaining untouched. A shoe called a "tip" is made by cutting off both branches at the cen-

ter of the foot and drawing the ends down to an edge. The tapering of the branches should begin at the toe, and the shoe should be of the usual width, with both the upper and lower surfaces flat. This tip is to be fastened on with six or eight small nails, all set well forward, two being in the toe. With a common foot rasp begin at the heels, close to the coronet, and cut away the horn of the wall until only a thin layer covers the soft tissues beneath. Cut forward until the new surface meets the same 2½ or 3 inches from the heel. The same sloping shape is to be observed in cutting downward toward the bottom of the foot, at which point the wall is to retain its normal thickness. The foot is now blistered all around the coronet with Spanish fly ointment, and when this is well set the patient is to be turned to pasture in a damp field or meadow. The blister should be repeated in three or four weeks, and, as a rule, the patient can be returned to work in two or three months' time. The object of the tip is to throw the weight on the frog and heels, which are readily spread after the horn has been cut away on the sides of the wall. The internal structures of the foot at the heels, being relieved of excessive pressure, regain their normal condition if the disease is not of too long standing. The blister not only tends to relieve any inflammation which may be present, but it also stimulates a rapid growth of healthy horn, which, in most cases, ultimately forms a wide and normal heel. In old chronic cases, with a shrunken frog and increased concavity of the sole, accompanied by excessive wasting of all the internal tissues of the foot, of course satisfactory results can not be expected and are rarely secured. Still much relief, if not an entire cure, may be affected by these measures.

When thrush is present as a complication its cure must be sought by such measures as are directed in a consideration of this disease under its proper heading. If sidebones, ringbones, navicular disease, contracted tendons, or other diseases have been the cause of contracted heels, of course treatment of the result will be useless until the cause is removed.

SAND-CRACKS.

A sand-crack is a solution of continuity or fissure in the horn of the wall of the foot. These fissures are quite narrow, and as a general rule they follow the direction of the horny fibers. They may happen on any part of the wall, but ordinarily they are only seen directly in front, when they are called *toe-cracks;* and on the lateral parts of the wall, when they are known as *quarter-cracks.* (Plate XXXIII.)

Toe-cracks are most common in the hind feet, while quarter-cracks nearly always affect the fore feet. The inside quarter is more liable to the injury than the outside one, for the reason that this quarter is not only the thinner, but during locomotion receives a greater part of the weight of the body. A sand-crack may be superficial, involving only

the outer parts of the wall, or it may be deep, involving the whole thickness of the wall and the soft tissues beneath.

The toe-crack is most likely to be complete—that is extending from the coronary band to the sole—while the quarter-crack is nearly always incomplete, at least when of comparatively recent origin. Sand-cracks are most serious when they involve the coronary band in the injury. They may be complicated at any time by hemorrhage, inflammation of the laminæ, suppuration, gangrene of the lateral cartilage and of the extensor tendon, caries of the coffin bone, or the growth of a horny tumor known as a keraphyllocele.

Causes.—Relative dryness of the horn is the principal predisposing cause of sand-cracks. Excessive dryness is perhaps not a more prolific cause of cracks in the horn than alternate changes from damp to dry. It is even claimed that these injuries are more common in animals working on wet roads than in those working on roads that are rough and dry; at least these injuries are not common in mountainous countries. Animals used to running at pasture when transferred to stables with hard, dry floors are more liable, especially to quarter-cracks, than those accustomed to stables. Small feet, with thick, hard hoofs, and feet which are excessively large, are more susceptible to sand-cracks than those of better proportion. A predisposition to quarter-crack exists in contracted feet, and in those where the toe turns out or the inside quarter turns under.

Heavy shoes, large nails, and nails set too far back toward the heels, together with such diseases as canker, quittor, grease, and suppurative corns must be included as occasional predisposing causes of sand-cracks.

Fast work on hard roads, jumping, and blows on the coronet, together with calk wounds of the feet, are accidental causes of quarter-cracks in particular. Toe-cracks are more likely to be caused by heavy pulling on slippery roads and pavements or on steep hills.

Symptoms.—The fissure in the horn is ofttimes the only evidence of the disease; and even this may be accidentally or purposely hidden from casual view by mud, ointments, tar, wax, putty, gutta-purcha, or by the long hairs of the coronet.

Sand-cracks sometimes commence on the internal face of the wall, involving its whole thickness, excepting a thin layer on the outer surface. In these cases the existence of the injury may be suspected from a slight depression, which begins near the coronary band and follows the direction of the horny fibers, but the trouble can only be positively diagnosed by paring away the outside layers of horn until the fissure is exposed. In toe-cracks the walls of the fissure are in close apposition when the foot receives the weight of the body, but when the foot is raised from the ground the fissure opens. In quarter-crack the opposite is true, and the fissure closes when the weight is removed from the foot. As a rule sand-cracks begin at the coronary band, and as they become older they not only extend downward, but they also grow

deeper. In old cases, particularly in toe-crack, the horn on the borders of the fissure loses its vitality and scales off, sometimes through the greater part of its thickness, leaving behind a rough and irregular channel extending from the coronet to the end of the toe.

In many cases of quarter-crack, and in some cases of toe-crack as well, if the edges remain close together, with but little motion, the fissure is dry, but in other cases a thin, offensive discharge issues from the crack and the ulcerated soft tissues, or a fungus-like growth, protrude from the narrow opening.

When the cracks are deep and the motion of their edges considerable, so that the soft tissues are bruised and pinched with every movement, a constant inflammation of the parts is maintained and the lameness is severe.

Ordinarily, the lameness of sand crack is slight when the patient walks; but it is greatly aggravated when he is made to trot, and the harder the road the worse he limps. Furthermore, the lameness is greater going down hill than up, for the reason that these conditions are favorable to an increased motion in the edges of the fissure. Lastly, more or less hemorrhage accompanies the inception of a sand crack when the whole thickness of the wall is involved. Subsequent hemorrhages may also take place from fast work, jumping, or a misstep.

Treatment.—In so far as preventive measures are concerned but little can be done. The suppleness of the horn is, of course, to be maintained by the use of ointments, damp floor, bedding, etc. The shoe is to be proportioned to the weight and work of the animal; the nails holding it in place are to be of proper size and not driven too near the heels; sufficient calks and toe-pieces must be added to the shoes of horses working on slippery roads, and the evils of jumping, fast driving, etc., are to be avoided.

When a fissure has made its appearance, means are to be adopted which will prevent it from growing longer or deeper; and this can only be done by arresting all motion in the edges. The best and simplest artificial appliance for holding the borders of a toe crack together is the Vachette clasp. These clasps, and the instruments necessary for their application, can be had of any of the more prominent makers of veterinary instruments. These instruments comprise a cautery iron with which two notches are burned in the wall, one on each side of the crack, and forceps with which the clasps are closed into place in the bottom of the notches and the edges of the fissure brought close together. The clasps being made of stiff steel wire are strong enough to prevent all motion in the borders of the crack. Before these clasps are applied the fissure should be thoroughly cleansed and dried, and, if the injury is of recent origin, the crack may be filled with a putty made of 2 parts of gutta percha and 1 part of gum ammoniac. The number of clasps to be used is to be determined by the length of the crack, the amount of motion to be arrested, etc. Generally the clasps are from one-half

to three-quarters of an inch apart. The clasps answer equally as well in quarter crack if the wall is sufficiently thick and not too dry and brittle to withstand the strain.

In the absence of these instruments and clasps a hole may be drilled through the horn across the fissure, and the crack closed with a thin nail made of tough iron, neatly clinched at both ends. A plate of steel or brass is sometimes fitted to the parts and fastened on with short screws; while this appliance may prevent much gaping of the fissure it does not entirely arrest motion of the edges for the simple reason that the plate and screw can not be rendered immobile.

If, for any reason, the above measures fail or can not be used recourse must be had to an operation. The horn is softened by the use of warm baths and poultices, the patient cast and the walls of the fissure are entirely removed with the knife. The horn removed is in the shape of the letter V with the base at the coronet. Care must be taken not to injure the coronary band and the laminæ. The wound is to be treated with mild stimulant dressings, such as a weak solution of carbolic acid, tincture of aloes, etc., oakum balls and a roller bandage. After a few days the wound will become covered with a new, white horn, and the oakum and bandages only will be needed. As the new quarter grows out the lameness disappears, and the patient may be shod with a bar shoe and returned to work.

In all cases of sand crack the growth of horn should be stimulated by cauterizing the coronary band, or by the use of blisters. In simple quarter crack recovery will often take place if the coronet is blistered, the foot shod with a "tip," and the patient turned to pasture.

The shoe, in toe crack, should have a clip on each side of the fissure and should be thicker at the toe than at the heels. The foot should be lowered at the heels by paring, and spared at the toe, except directly under the fissure where it is to be pared away until it sets free from the shoe.

When any of the complications referred to above arise, special measures must of course be resorted to. For the proper treatment of gangrene of the lateral cartilage and extensor tendon and caries of the coffin bone, reference may be had to the articles on quittors. If the horny tumor known as keraphyllocele should develop it is to be removed by the use of the knife. Since this tumor develops on the inside of the horny box and may involve other important organs of the foot in disease, its removal should only be undertaken by a skillful surgeon.

NAVICULAR DISEASE.

Navicular disease, often called "navicular arthritis" by the English, is an inflamation of the sesamoid sheath, induced by repeated bruising or laceration, and complicated in many cases by inflammation and caries of the navicular bone. In some instances the disease undoubtedly be-

gins in the bone, and the sesamoid sheath becomes involved subsequently by an extension of the inflammatory process. (Plate XXXII, Fig. 5.)

The thoroughbred horse is more commonly affected with the disease than any other, yet no class or breed of horses is entirely exempt. The mule, however, seems rarely, if ever, to suffer from it. For reasons which will appear when considering the causes of the disease the hind feet are not liable to be affected. As a general rule but one fore foot suffers from the disease, but if both should be attacked the trouble has become chronic in the first before the second shows signs of the disease.

Causes.—To comprehend fully how navicular disease may be caused by conditions and usages common to nearly all animals, it is necessary to recall the peculiar anatomy of the parts involved in the process and the functions which they perform in locomotion. It must be remembered that the fore legs largely support the weight of the body when the animal is at rest, and that the faster he moves the greater is the shock which the fore feet must sustain as the body is thrown forward upon them by the propelling force of the hind legs. This shock could not be withstood by the tissues of the fore feet and legs were it not that it is largely dissipated by the elastic muscles which bind the shoulder to the body, the ease with which the arm closes on the shoulder blade, and the spring of the fetlock joint. But even these means are not sufficient within themselves to protect the foot from injury, and so nature has further supplemented them by placing the coffin joint on the hind part of the coffin bone instead of directly on top of it, whereby a large part of the shock of locomotion is dispersed before it can reach the vertical column, represented in the cannon, knee, and arm bones. A still further provision is made by placing a soft, elastic pad—the frog and plantar cushion—at the heels to receive the sesamoid expansion of the flexor tendon as it is forced downward by the pressure of the coronet bone against the navicular. Extraordinary as these means may appear for the destruction of shock, and ample as they are when the animal is at a slow pace or unweighted by rider or load, they fail to completely relieve the parts from concussion and excessive pressure whenever the opposite conditions are present. The result, then, is that the coronet bone forces the navicular hard against the flexor tendon, which, in turn, presses firmly against the navicular as the force of the contracting muscles lifts the tendon into place. It is self-evident, then, that the more rapid the pace and the greater the load, the greater must these contending forces be, and the greater the liability to injury. For the same reason horses with excessive knee action are more likely to suffer from this disease than others, concussion of the foot and intense pressure on the tendon being common attendants upon their usage. Besides these exciting causes must be considered those which predispose to the disease. Most prominent among these is heredity. It may be claimed, however, that an inherited predisposition to navicular disease consists not so much in a special susceptibility of the tissues which are involved

in the process as in a vice of conformation which, as is well known, is likely to be transmitted from parent to offspring. The faults of conformation most likely to be followed by the development of navicular disease are an insufficient plantar cushion, a small frog, high heels, excessive knee action, and contracted heels. Finally, the environments of domestication and use, such as dry stables, heavy pulling, bad shoeing, punctured wounds, etc., all have their influence in developing this disease.

Symptoms.—In the early stages of navicular disease the symptoms are generally very obscure. When the disease begins in inflammation of the navicular bone the animal points the affected foot while at rest, a time before any lameness is seen. While at work he apparently travels as well as ever, but when placed in the stable one foot is set out in front of the other, resting on the toe, with fetlock and knee flexed. After a time, if the case is closely watched, the animal takes a few lame steps while at work, but the lameness disappears as suddenly as it came and the driver doubts if the animal was really lame at all. Later on the patient has a lame spell which may last during a greater part of the day, but the next morning it is gone; he leaves the stable all right, but goes lame again during the day. In time he has a severe attack of lameness, which may last for a week or more, when a remission takes place and it may be weeks or months before another attack supervenes. Finally, he becomes constantly lame, and the more he is used the greater the lameness.

In the lameness from navicular disease the affected leg always takes a short step, and the toe of the foot first strikes the ground, so that the shoe is most worn at this point. If the patient is made to move backwards the foot is set down with exceeding great care, and the weight rests upon the affected leg but a moment. When exercised he often stumbles, and if the road is rough he may fall on his knees. If he is lame in both feet the gait is stilty, the shoulders seem stiff, and if the patient is made to work he sweats profusely from the intense pain. Early in the development of the disease a careful examination will reveal some increased heat in the heels and frog, particularly after work; as the disease progresses this becomes more marked until the whole foot is hot to the touch. At the same time there is an increased sensibility of the foot, for the patient flinches from the percussion of a hammer lightly applied to the frog and heels, or from the pressure of the smith's pincers. The frog is generally shrunken, often of a pale reddish color, and at times it is affected with thrush. If the heels are pared away so that all the weight is received on the frog, or if the same result is attained by the application of a bar shoe, the animal is excessively lame. The muscles of the leg and shoulder shrink away, and often tremble as the animal stands at rest. After months of lameness the foot is found to be shrunken in its diameter and apparently lengthened; the horn is dry and brittle and has lost its natural gloss, while

circular ridges, developed most toward the heels, cover the upper part of the hoof. When both feet are affected the animal points first one foot then the other, and stands with the hind feet well forward beneath the body so as to relieve the forefeet as much as possible from bearing weight. In old cases the wasting of the muscles and the knuckling at the fetlock become so great that the leg can not be straightened, and locomotion can scarcely be performed. The disease generally makes a steady progress without inclining to recovery—the remission of symptoms in the earlier stages should not be interpreted as evidence that the process has terminated. The complications usually seen are ringbones, sidebones, thrush, contracted heels, quarter cracks, and fractures of the navicular, coronet, and pastern bones.

Treatment.—But few cases of navicular disease recover. In the early stages the wall of the heels should be rasped away as directed in the treatment for contracted heels, until the horn is quite thin; the coronet should be well blistered with Spanish-fly ointment, and the patient turned to grass in a damp field or meadow. After three or four weeks' time the blister should be repeated. This treatment is to be continued for two or three months. Plane shoes are to be put on when the patient is returned to work. In chronic cases the animal should be put to slow, easy work. To relieve the pain, neurotomy may be performed--an operation in which the sense of feeling is destroyed in the foot by cutting out pieces of the nerve at the fetlock. This operation in nowise cures the disease, and since it may be attended with serious results can only be advised in certain favorable cases. to be determined by the veterinarian.

SIDEBONES.

A sidebone consists in a transformation of the lateral cartilages found on the wings of the coffin bone into bony matter by the deposition of lime salts. The disease is a common one, especially in heavy horses used for draft, in cavalry horses, cow-ponies, and other saddle horses, and in runners and trotters.

Sidebones are peculiar to the fore feet, yet they occasionally develop in the hind feet where they are of little importance, since they cause no lameness. In many instances sidebones are of slow growth, and being unaccompanied by acute inflammation, they cause no lameness until such time as, by reason of their size, they interfere with the action of the joint. (Plate XXXII, Fig. 4.)

Causes.—Sidebones often grow in heavy horses without any apparent injury, and their development has been attributed to the overexpansion of the cartilages caused by the great weight of the animal. Blows, and other injuries to the cartilages, may set up an inflammatory process which ends in the formation of these bony growths. High-heeled shoes, high calks, and long feet are always classed among the conditions which may excite the growth of sidebones. They are often seen in connec-

tion with contracted heels, ringbones, navicular diseases, punctured wounds of the foot, quarter crack, and occasionally as a sequel to founder.

Symptoms.—In the earlier stages of the disease, if inflammation is present, the only evidence of the trouble to be detected is a little fever over the seat of the affected cartilage and a slight lameness. In the lameness of sidebones the toe of the foot first strikes the ground and the step is shorter than natural. The subject comes out of the stable stiff and sore, but the gait is more free after exercise.

Since the deposit of the bony matter often begins in that part of the cartilage where it is attached to the coffin bone, the diseased process may exist for some time before the bony growth can be seen or felt. Later on, however, the cartilage can be felt to have lost its soft elastic character, and by standing in front of the animal a prominence of the coronary region at the quarters can be seen. Occasionally these bones become so large as to bulge the hoof outward, and by pressing on the joint they so interfere with locomotion that the animal becomes entirely useless.

Treatment.—So soon as the disease can be diagnosed active treatment should be adopted. Cold water bandages are to be used for a few days to relieve the fever and soreness.

The improvement consequent on the use of these simple measures often leads to the belief that the disease has recovered; but with a return to work the lameness, fever, etc., reappears. For this reason the use of blisters, or better still the firing iron, should follow on the discontinuance of the cold bandages.

But in many instances no treatment will arrest the growth of these bony tumors, and as a palliative measure neurotomy must be resorted to. Generally this operation will so relieve the pain of locomotion that the patient may be used for slow work; but in animals used for faster driving or for saddle purposes the operation is practically useless. Some years ago I unnerved a number of cavalry horses at Fort Leavenworth that were suffering from sidebones, and the records show that in less than seven months' time all were more lame than ever. Since a predisposition to develop sidebones may be inherited, animals suffering from this disease should not be used for breeding purposes unless the trouble is known to have originated from an accident.

RINGBONE.

A ringbone is the growth of a bony tumor on the ankle. This tumor is in fact not the disease, but simply the result effected by an inflammatory action set up in the periosteum and bone tissue proper of the large and small pastern bones. (Plate XXXII, Fig. 1.)

Causes.—Injuries, such as blows, sprains, overwork in young undeveloped animals, fast work on hard roads, jumping, etc., are among the principal exciting causes of ringbones. Horses most disposed to this

disease are those with short upright pasterns, for the reason that the shock of locomotion is but imperfectly dissipated in the fore legs of these animals. Improper shoeing, such as the use of high calks, a too great shortening of the toe and correspondingly high heels, predispose to this disease by increasing the concussion to the feet.

Symptoms.—The first symptom of an actively developed ringbone is the appearance of a lameness more or less acute. If the bony tumor forms on the side or upper parts of the large pastern its growth is generally unattended with acute inflammatory action, and, consequently, produces no lameness or evident fever. These are called false ringbones. But when the tumors form on the whole circumference of the ankle, or simply in front under the extensor tendon, or behind under the flexor tendons; or if they involve the joints between the two pastern bones, or between the small pastern and the coffin bone, the lameness is always severe. These constitute the true ringbone. Besides the lameness the ankle of the affected limb presents more or less heat, and in many instances a rather firm, though limited, swelling of the deeper tissues over the seat of the inflammatory process. The lameness of ringbone is characteristic in that the heel is first placed on the ground when the disease is in a fore leg, and the ankle is kept as rigid as possible. In the hind leg, however, the toe strikes the ground first when the ringbone is high on the ankle, just as in health; but the ankle is maintained in a rigid position. If the bony growth is under the front tendon of the hind leg, or if it involves the coffin joint, the heel is brought to the ground first. In the early stages of the disease it is not always easy to diagnose ringbone; but when the deposits have reached some size they can be felt and seen as well.

The importance of a ringbone of course depends on its seat, and often on its size. If it interferes with the joints, or with the tendons, it may cause an incurable lameness even though small. If it is on the sides of the large pastern, the lameness generally disappears as soon as the tumor has reached its growth and the inflammation subsides. Even where the pastern joint is involved, if complete anchylosis results, the patient may recover from the lameness with simply an imperfect actioh of the foot remaining, due to the stiff joint.

Treatment.—Before the bony growth has commenced, the inflammatory process may be cut short by the use of cold baths and wet bandages, followed by one or more blisters. If the bony deposits have begun, the firing iron should always be used. Even where the tumors are large and the pastern joint involved, firing often hastens the process of anchylosis, and should always be tried.

Where the lower joint is involved, or where the tumor interferes with the action of the tendons, of course recovery is not to be expected. In many of these latter cases, however, the animal may be made serviceable by proper shoeing. If the patient walks with the toe on the ground the foot should be shod with a high-heeled shoe and a short toe. On

the other hand, if he walks on the heel a thick-toed and thin-heeled shoe must be worn.

Since ringbone is considered to be one of the hereditary diseases no animal suffering from this trouble should ever be used for breeding purposes.

LAMINITIS.

By what term this disease was first known to man is a question unanswerable. During many years in the recent past, and before an approximate knowledge of its lesions was had, it was usually designated as "founder."

In country districts and amongst the great majority of the laity this name is yet almost exclusively used; and undoubtedly it was first so employed because it best expressed the physical inability or disinclination upon the part of the patient to proceed in his gait, resembling thereby a ship similarly disabled. That it could have been adopted upon any other ground hardly seems possible, for the etymology of the term does not indicate that it was so used because it contained even the most remote intimation either as to the seat of the disease, its nature or its cause.

Of the nature of laminitis but little is to be said, it being a simple inflammation of the sensitive laminæ of the feet, characterized by the general phenomena attending inflammation of the skin and mucous membranes, producing no constitutional disturbances except those dependent upon the local disease, and having a strong tendency, in severe cases, to destructive disorganization of the tissues affected.

Causes.—The causes of laminitis are as wide and variable as in any of the local inflammations, and may be divided into two classes—the *predisposing* and *exciting*.

Predisposing causes.—From personal observations I do not know that any particular construction of foot or any special breed of horses are thereby predisposed to this disease, neither can I find anything to warrant the assumption that it is in any way hereditary; so that while we may easily cultivate a predisposition of the disease upon the part of the tissues subject to become affected, the disease itself does not originate without an exciting cause. Like most other tissues, a predisposition to inflammation may be induced in the sensitive laminæ by any cause which lessens their power of withstanding the work imposed on them. It exists to an extent in those animals unaccustomed to work, particularly if they are plethoric, and in all those that have been previous subjects of the disease, for the same rule holds good here that we find in so many diseases—*i. e.*, that one attack impairs the functional activity of the affected tissues and thus renders them more easy of a subsequent inflammation.

Unusual excitement by determining an excessive blood supply, bad shoeing, careless paring of the feet by removing the sole support, as

well as high calkings without corresponding toe pieces, must be included under this head.

Exciting causes.—The exciting causes of laminitis are many and varied, the most common being concussion, overexertion, exhaustion, rapid changes of temperature, ingestion of various foods, purgatives, and the oft-mentioned metastasis.

(1) Concussion acts as a producer of this disease by the local overstimulation which it occasions, the excessive excitement being followed by an almost complete exhaustion of the functional activity of the laminated tissues, the exhaustion by congestion, and eventually by inflammation. But congestion here, as in all other tissues, is not necessarily followed by inflammation; for although the principal symptoms belonging to true laminitis are present, the congestion may be relieved before the processes of inflammation are fully established. This is the condition that obtains in the many so-called cases of laminitis, which recover in from twenty-four to forty-eight hours' time. These are the cases which should be called congestion of the laminæ.

Laminitis from concussion is common in track horses trotting races when not in condition, especially if they are carrying the obnoxious toe weights, and in green horses put to work on city pavements to which they are unaccustomed. Concussion from long drives on dirt roads is at times productive of the same results, notably when the weather is extremely warm, or at least when the relative change of temperature is great. But undoubtedly the exhaustion so apt to be produced under these circumstances must be considered as exerting almost as great an influence as an exciting cause as does the long-continued concussion. This same combination of causes must also be admitted as determining the disease when seen at times in hunters, for the imposed weight of the rider increases the demands made upon the function of these tissues, and their powers of resisting congestion and its consequences are the sooner exhausted.

(2) Overexertion, as heavy pulling or rapid work, even where there is no chance for immoderate concussion, occasionally results in this disease, although in the majority of instances exhaustion is a conjunctive cause, for overexertion can not be long continued without inducing exhaustion.

(3) Exhaustion, in whatever manner produced, is nearly as prolific a source of laminitis as is concussion, for when the physical strength has been greatly impaired, even though but temporarily, some part of the economy is rendered more vulnerable to disease than others, and it is not strange that in many instances it should be those parts still called upon to perform their function of maintaining the weight of the body after their activity has been exhausted. It is to this cause we must ascribe those many cases which we see following a hard day's work, where at no time has there been overexertion or immoderate concussion.

In the same manner a strong tendency to laminitis is induced in horses on sea voyages, the exhaustion of the laminæ resulting from the continual constrained position which the animal is compelled to maintain on account of the rocking motion of the vessel.

The same cause exists where one foot has been blistered, or where one limb is incapacitated from any other reason; for the opposite member being called on to do double duty, soon becomes exhausted, and congestion, followed by inflammation, results as a matter of course. Where one foot only becomes laminitic, it is customary to find the other or corresponding member participating at a later date, not always because of sympathy, but because the transfer of all the functional performance to the one foot proves within itself a sufficient exciting cause.

(4) Rapid changes of temperature act as an exciting cause of laminitis in precisely the same way as they act to produce disease in other tissues, the result of these variations of temperature showing itself upon those parts rendered particularly susceptible to pathological changes from some impairment of their natural disease-resisting powers.

This change of temperature may be induced by drinking large quantities of cold water while in an overheated condition. Here the internal heat is rapidly reduced, the neighboring tissues and blood-vessels constrained, and the blood supply to these organs greatly diminished, while the quantity sent to the surface is correspondingly increased. True, in many of the cases which result from this cause there has not been sufficient labor performed to impair the powers of the laminæ, and I am inclined to the opinion that laminitis is the more readily induced than congestion or inflammation of the skin or other surface organs because of the impossibility upon the part of the laminæ to relieve themselves of the threatened congestion by the general safety-valve of perspiration. A cold wind or relatively cold air allowed to play upon the body when heated and wet with sweat has virtually the same result, for it arrests evaporation and rapidly cools the external surface, thereby determining an excess of blood to such organs and tissues as are protected from this outside influence. In many instances this happens to be some of the internal organs, as the lungs, where the previous work has been rapid and their functional activity impaired; but in numerous other instances the determination is toward the feet, and that it is so depends upon two very palpable facts; first, that these tissues have been greatly excited and are already receiving as much blood as they can accommodate consistently with health; secondly, even though these tissues are classed with those of the surface, their protection from atmospheric influences by means of the thick box of horn incasing them renders them in this respect equivalent to internal organs.

Again, a still more limited local action of cold excites this disease, as seen from driving through water or washing the feet or legs while the animal is warm or just in from work. Here a very marked reaction takes place in the surface tissues of the limbs, and passive congestion

of the foot results from an interference with the return flow of blood, which is being sent to these organs in excess. These are more apt to be simple cases of congestion, soon to recover, yet they may become true cases of laminitis. Youatt says: "The danger is not confined to the change from heat to cold; a sudden transition from cold to heat is as injurious, and therefore it is that so many horses after having been ridden far in frost and snow and placed immediately in a hot stable and littered up to the knees are attacked by this complaint." I have never seen the disease occur under exactly similar circumstances, but am inclined to believe that in these cases the disease was attributed to the wrong cause—the excitement, exhaustion, and concussion of the long ride being apparently entirely overlooked. Furthermore, if we consider the physical conditions which must necessarily be present under the circumstances, it seems inconsistent with our knowledge of the effects of heat and cold to believe that the very moderate temperature of stables and the heat-producing properties of bedding "up to the knees" could be productive of laminitis. Rather should we say that such favorable circumstances would be conducive to opposite results.

(5) Why it is that certain kinds of grain will cause laminitis does not seem to be clearly understood. Certainly they possess no specific action upon the laminæ, for all animals are not alike affected, neither do they always produce these results in the same animal. In the case of some of these ailments, where their ingestion causes a strong tendency to indigestion, the consequent irritation of the alimentary canal may be so great as to warrant the belief that the laminæ are affected through sympathy. In other instances there is no apparent interference with digestion, nor evidence of any irritation of the mucous membranes, yet the disease is in some manner dependent upon the food in question for its inception. Barley, wheat, and sometimes corn are the grains most prolific in the production of this disease. With some horses there appears to be a particular susceptibility to this influence of corn. In such instances the feeding of this grain for a few days will be followed by inflammation of the feet, lasting from a few days to two weeks time. In these animals, to all appearances healthy, the corn neither induces colic, indigestion, nor purging, and apparently no irritation whatever of the alimentary canal.

(6) Fortunately purgative medicines but rarely become the exciting cause of inflammation of the laminæ. That it is then the result of a sympathetic action upon the part of the tissues affected is no doubt more than hypothetical, for when there is no derangement of the alimentary canal existing a dose of cathartic medicine will at times bring on severe laminitis, and that, too, before purgation commences.

(7) Most if not all the older authorities were agreed that metastatic laminitis is a reality. That such a condition ever does exist outside the magination certainly awaits the proving. That laminitis may and ofttimes does exist as a concurrent disease with numerous others is un-

questionably true, but to believe an inflammation can be almost momentarily transferred from one organ to another, no matter how remote, is to destroy all belief in our knowledge of the pathology of this complicated process. We do not pretend to deny that the induction of laminitis, during the course of some other disease, may serve to arrest the further invasion of healthy tissue by the primary process, or that it may exert a remedial influence upon the first disease, but it can not and does not at once remove that inflammation and obliterate its lesions, for the products of any inflammation, be it never so simple, require a certain time for their removal, and it is impossible that, for instance, the products of inflamed lung tissue can be immediately removed and the inflammation in whole transferred to the laminæ. Metastatic laminitis, then, is nothing more nor less than concurrent laminitis, and as such presents little in anyway peculiar outside the imperfectly understood exciting cause, and the practitioner who allows the acute symptoms of the laminitis to mislead him, simply because their severity has overshadowed those of the primary disease, may lose his case through unguarded subsequent treatment. This form of laminitis is by no means commonly met with, but when seen will usually be found in conjunction with pneumonia, according to Youatt with inflammation of the bowels and eyes, and according to Law and Williams sometimes with bronchitis.

Symptoms.—Laminitis is characterized by a congregation of symptoms so well marked as scarcely to be misinterpreted by the most casual observer. They are nearly constant in their manifestations, modified by the number of feet affected, the cause which has induced the disease, the previous condition of the patient, and the various other influences which operate in all diseases to some extent. They may be divided into general symptoms, which are concomitants of all cases of the disease, subject to variations in degree only and special symptoms, or those which serve to determine the feet affected and the complications which may arise.

General symptoms.—Usually the first symptoms that would indicate any definite obstruction to functional performance is the interference with locomotion produced by congestion of the sensitive membrane. Occasionally the other symptoms are presented first. With the development of the lameness the pulse will be found accelerated, full, hard, and striking the finger strongly; the temperature soon rises several degrees above the normal, reaching sometimes 106° Fahr., although it generally ranges between 102½° and 105° Fahr. The respirations are rapid and panting in character, the nostrils being widely dilated, and the mucous membranes highly injected. The facial expression is anxious and indicative of the most acute suffering, while the body is more or less bedewed with sweat. At first there may be tendency to diarrhea, or it may appear later, particularly as the result of the medicines used. The urine is high colored, scant in quantity, and of increased

specific gravity, owing to the water from the system being eliminated by the skin instead of the kidneys. The appetite is impaired and sometimes entirely lost, while the thirst is greatly increased. The affected feet are hot and dry to the touch. They are relieved as much as possible from bearing weight. Rapping them with a hammer or compelling the animal to stand upon one affected member causes intense pain, while the artery at the fetlock throbs beneath the finger.

Special symptoms.—Liability to affection varies in the different feet according to the exciting cause. Any one or more of the feet may become the subject of this disease, although it appears more often in the fore feet than in the hind ones, a fact owing to the difference of function, *i. e.*, that the fore feet are the basis of the columns of support, receiving nearly all the body weight during progression and consequently most of the concussion, while the hind feet at such times becomes simply the fulcra of the levers of progression, and are almost exempt from concussion.

One foot.—Injuries and excessive functional performance are the causes of the disease in only one foot; here the general symptoms as a rule are not severe, there often being no loss of appetite and no unusual thirst, while the pulse, temperature and respiration remain about normal. In these instances the weight of the body is early thrown upon the opposite foot and the affected one is extended, repeatedly raised from the floor and then carefully replaced. When made to move forward the lame foot is either carried in the air while progression is accomplished by hopping with the healthy one, or else the heel of the first is placed upon the ground and receives the little weight thrown upon it while the sound limb is quickly advanced. Progression in a straight line is much more easily accomplished than in turning toward the lame side.

Both fore feet.—When both fore feet are affected the symptoms are well marked. The lameness is excessive and the animal almost immovable. When standing the head hangs low down, or rests upon the manger as a means of support and to relieve the feet; the fore feet are well extended so that the weight is thrown upon the heels, where the tissues are least sensitive, least inflamed, and most capable of relief from free effusion. The hind feet are brought forward beneath the body to receive as much weight as possible, thereby relieving the diseased ones. If progression is attempted, which rarely happens voluntarily during the first three or four days, it is accomplished with very great pain and lameness at the starting, which usually subsides to an extent after a few minutes' exercise. During this exercise, if the animal happens to step upon a small stone or other hard substance, he stumbles painfully on the other foot and is excessively lame in the offended member for a number of steps, owing to the acute pain which pressure upon the sole causes in the tissues beneath. The manner of the progression is pathognomonic of the complaint. Sometimes the affected

feet are simultaneously raised from the ground (the hind ones sustaining the weight), then advanced a short distance and carefully replaced, while at almost the same moment the hind ones are quickly shuffled forward near to the center of gravitation.

In other instances one foot at a time is advanced and placed with the heel upon the ground in the same careful manner, all causes of concussion being carefully avoided. In attempting to back the animal he is found to be almost stationary, simply swaying the body back on the haunches and elevating the toes of the diseased feet as they rest upon their heels. In attempting to turn either to the right or left he allows his head to be drawn to the one side to its full extent before moving, then makes his hind feet the axis around which the forward ones describe a shuffling circle.

In a majority of cases of laminitis in the fore feet the animal persists in standing until he is nearly recovered. In other cases he as persistently lies, standing only when necessity seems to compel it, and then for as short a time as possible. If the recumbent position is once assumed the relief experienced from a removal of the weight of the body off the inflamed tissues tempts the patient to seek it again, and so we often find him down a greater part of the time. But this is not true of all cases, for sometimes he will make the experiment, then cautiously guard against a repetition. Even in those cases of enforced recumbency, he ofttimes takes advantage of the first opportunity and gets upon his feet, doggedly remaining there until again laid upon his side by his attendants. How to explain this diversity of action I do not know, for theoretically the recumbent position is the only appropriate one, except when complications exist, and the one which should give the most comfort, yet it is rejected by very many patients and no doubt for some good reason. It has been suggested as an explanation that when the animal gets upon his feet after lying for a time the suffering is so greatly augmented that the memory of this experience deters him from an attempted repetition. If this were true, the horse with the first attack of this disease must necessarily make the experiment before knowing the after effects of lying down, yet many remain standing without even an attempt at gaining this experimental knowledge.

The most favored position of the animal when down is on the broadside, with the feet and legs extending. While in this position the general symptoms greatly subside; the respirations and pulse become almost normal; the temperature falls and the perspiration dries. It is mostly with difficulty that he is made to rise, and when he attempts it gets up rapidly and "all in a heap," as it were, shifting quickly from one to the other foot until they become accustomed again to the weight thrown upon them. Occasionally a patient will get up like a cow, rising upon the hind feet first. Although enforced exercise relieves to some extent the soreness, it is but temporary, for after a few minutes' rest it returns again with all its former severity.

Both hind feet.—When only both hind feet are affected, they are, while standing, maintained in the same position as when only the fore ones are the subjects of the disease, but with an entirely different object in view. Instead of being here to receive weight, they are so advanced in that the heels may receive whatever weight is, from necessity, imposed on them, the fore feet being at the same time placed well back beneath the body, where they become the main supports, the animal standing, as Williams describes it, "all of a heap."

Progression is even more difficult now than when the disease is confined to the anterior extremities. The fore feet are dubiously advanced a short distance and the hind ones are then brought forward with a kind of a kangaroo hop, which results in an apparent loss of equilibrium which the animal is a few moments in regaining. The general symptoms, or in other words the degree of suffering, seem more severe in these cases than where the disease affects the fore feet alone. The standing position is not often maintained, the patient seeking relief in recumbency. This fact is easily understood when we consider how cramped and unnatural is the position he assumes while standing, and if it were maintained for any considerable length of time would no doubt excite the disease in the fore feet, as explained by D'Arboval.

All four feet.—Laminitis of all four feet is but uncommonly met with. The author has seen but three such cases. In all these the position assumed was nearly normal, all the feet being slightly advanced, and first one then another momentarily raised from the ground and carefully replaced, this action being kept up almost continually during the time the animal remained standing. The suffering in these cases is most acute, the appetite is lost, and although the patient lies most of the time the temperature remains too high; the pulse and respirations are greatly accelerated, the body covered with sweat, and bed sores are unpleasant accompaniments.

Course.—The course which laminitis takes varies greatly in different cases, being influenced more or less by the exciting cause, the animal's previous condition, the acuteness of the attack, and the subsequent treatment. The first symptoms rarely exhibit themselves while the animal is at his work, although we will occasionally see the gait impaired by stumbling, the body covered with a profuse sweat, and the respiration become blowing in character as premonitions of the oncoming disease, but as a rule nothing is noted amiss with the animal until he has stood for some time after coming in from work, when, in attempting to move him, he is found very stiff. Like all congestions the early symptoms usually develop rapidly, yet this is not always the case, for in some instances there appears to be no well-defined period of congestion, the disease seemingly commencing at a point and gradually spreading until a large territory is involved in the morbid process.

Simple congestion.—Those cases of simple congestion of the laminæ, which we erroneously call laminitis, are rapidly developed, the symp-

toms being but moderately severe and from one to three days required for recovery. There are no structural changes here and but a moderate exudate, which is rapidly reabsorbed, leaving the parts pecisely in the came condition as they were previous to the attack. If the congestion has been excessive a rupture of some of the capillaries will be found, a condition more apt to obtain where the animal is made to continue work after a development of symptoms has begun.

True, the majority of these last-described cases prove to be the laminitis in fact, yet at times the congestion will pass away and the extravasated blood be absorbed without inflammation supervening to an extent sufficient to warrant us calling it laminitis. The seat of greatest congestion will always be found in the neighborhood of the toe, because of the increased vascularity of that part, and although at times it is limited to the podophyllous tissue alone, any or all parts of the keratogenous membrane may be affected by the congestion and followed finally by inflammation.

Acute.—In the acute form of laminitis the symptoms may all develop rapidly, or it may commence by the appearance of a little soreness of the feet during progression, which in twenty-four or forty-eight hours' time has passed into a well-marked case. This peculiarity of development is due to one of two causes. Either the congestion is general, but takes place slowly, or else it begins in one or more points and gradually spreads throughout the laminæ. These acute cases generally run their course in from a few days to two weeks or more time. Usually a culmination of the symptoms is reached if the patient is properly treated in from three to five days; then evidences of recovery are discernable in favorable cases. The lameness improves, the other symptoms gradually subside, and eventually health is regained. It is in these acute cases that a strong tendency to disorganization of a destructive character exists, and hence it is we see so many recover imperfectly with marked structural changes permanently remaining.

Subacute.—Subacute laminitis is most often seen as a termination of the acute form, although at times it exists independent of or precedes an acute attack. It is characterized by the mildness of its symptems, slow course, and moderate tissue changes. It may be present for a long time before any pathologhical lesions result other than those found in the acute form, and when these changes do take place they should rather be viewed as complications.

Chronic.—Chronic laminitis is a term used by many to designate any of the sequelæ of the acute and subacute forms of this disease. Pure chronic inflammation of the laminæ is not very commonly met with, but is most frequent in horses that have long done fast track work. They have "fever in the feet" at all times and are continually sore, both conditions being aggravated by work. Like chronic inflammation of other parts there is a strong tendency here to the development of new connective tissues, which, by its pressure upon the blood vessels, interferes

with nutrition. Wasting of the coffin bone and inflammation of its covering with caries is not unusual. The continued fever and impaired function of secretion result in the production of horn deficient in elasticity, somewhat spongy in character, and inclined to crumble. In others of these cases of "soreness" in horses used to hard work, there is evident weakness of the coats of the vessels brought on by repeated functional exhaustion. Here slight work acts as an exciting cause of congestion, which results in serious effusion and temporary symptoms similar to those of chronic laminitis.

Complications.—Complications concurrent with or supervening upon laminitis are frequent and varied, and are often dependent upon causes not fully understood.

Excessive purgation is one of the simplest of these, and not usually attended with dangerous consequences. It rarely occurs unless induced by the exhibition of a purgative, and the excessive action of the medicine is probably to be explained upon the theory that the mucous membrane sympathizes with the diseased laminæ, is irritable, and readily becomes overexcited. The discharges are thin and watery, sometimes offensively odorous, and occasionally persist in spite of treatment. It may prove disastrous to the welfare of the patient by the rapid exhaustion which it causes, preventing resolution of the laminitis, and may even cause death.

Septicæmia and pyæmia.—Septicæmia or Pyæmia are unusual complications and are seen only in the most severe cases, where bed-sores are present or suppuration of the laminæ results. They die, as a rule, within three days after showing signs of the complication.

Pneumonia—the so-called metastatic—needs no special consideration, for in its lesions and symptoms it does not differ from ordinary pneumonia, although it may be overlooked entirely by the practitioner. Examinations of the chest in laminitis should be made every day, so as to detect the disease at its onset and render proper aid.

Sidebones.—A rapid development of sidebones is one of the complications, or perhaps better, a sequel of laminitis not often met with in practice. Here the inflammatory process extends to the lateral cartilages, with a strong tendency to calcification. The deposition of the lime salts is sometimes most rapid, so that the "bones" are developed in a few weeks' time; in other instances they are deposited slowly and their growth is not noted until long after the subsidence of the laminitis, so that the exciting cause is not suspected. This change in the cartilages may commence as early as the first week of the laminitis, and although the trouble in the laminæ is removed in the course of a fortnight the symptoms do not entirely subside, the animal still retaining the shuffling gait, while the sidebones continue to grow and the patient usually remains quite lame. This alteration of the cartilages generally prevents the patient recovering his natural gait, because of the permanent impairment of function induced, and the practitioner receives un-

just censure for a condition of affairs he could neither foresee nor prevent.

The laminitic process also occasionally extends to the covering of the coronet bone, or at least concurrent with and subsequent to laminitis the development of "low ringbone" is seen, and it is apparently dependent upon the disease of the laminæ for its exciting cause. The impairment of function and consequent symptoms are much less marked here than in sidebones. The coronet remains hot and sensitive and somewhat thickened after the laminitis subsides, and a little lameness is present. This lameness persists and the deposits of new bone may readily be detected.

Suppuration of the sensitive membrane is a somewhat common complication, and even when present in its most limited form is always a serious matter; but when it becomes extensive, and especially where the suppurative process extends to the periosteum, the results are apt to be fatal. When suppuration occurs the exudation does not appear to be excessive, but is rich in leucocytes and seems to have caused a detachment of the sensitive tissues from the horn prior to the formation of pus in some instances, while in others the tissues are still attached to the horn and the suppuration takes place in the deeper tissues.

Limited suppuration may take place in any part of the sensitive tissues of the foot during laminitis, and may ultimately be reabsorbed instead of being discharged upon the surface, but generally the process begins in the neighborhood of the toe and spreads backward and upward towards the coronet, where it is seen separating the horn from the coronary band at the quarters. At the same time it is spreading over the sole and eventually the entire hoof is loosened and finally sloughs away, leaving the tissues beneath entirely unprotected.

In other instances, and these are generally the cases not considered unusually severe, the suppuration begins at the coronary band. The suppuration extends but a short distance in the tissue, yet serves to destroy the patient by separating the hoof from the coronary band upon which it depends for support and growth. In this form of the suppurative process it is usually seen beginning in front, for it is this part of the coronary band that is always most actively affected with inflammation, and consequently it is here that impairments first occur. Suppuration of the sensitive sole is more common than of the sensitive laminæ and coronary band. It is present in the majority of cases where there is a dropping of the coffin bone, and in other instances where the effusion at this point is so great as to arrest the production of horn and uncover the sensitive tissues. Except when the result of injury it begins at the toe and spreads backward, and if not relieved by opening the sole escapes at the heel. Suppuration of the sole is much less serious than where present in other parts of the foot.

If the acute constitutional symptoms developed from this sloughing

of the foot do not result in death, a new hoof of very imperfect horn may be developed after a time, but unless the animal is to be kept for breeding purposes alone the foot will ever be useless for work and death should relieve the suffering. When only the sole sloughs recovery takes place with proper treatment.

Peditis.—This is the term which Williams applies to that serious complication of laminitis where not only the laminæ but the periosteum and the coffin bone are also the subjects of the inflammatory process. Neither is this all, for in some of these cases of peditis acute inflammation of the "coffin joint" is present, and occasionally suppuration of the joint. A mild form of periostitis, in which the exudation is in the outer or looser layer of the periosteum only, is a more common condition than is recognized by practitioners generally, and the intimate contiguity of structures is the predisposing cause, the disease either spreading from the original seat, or the complication occurs as one of the primary results of the exciting cause. In the severer cases where the exudate separates the periosteum from the bone, suppuration, gangrene, and superficial caries are common results; where infiltration of the bone tissues is rapid the blood supply is cut off by the pressure upon the vessels and death of the coffin bone ensues. Grave constitutional symptoms mark these changes and soon prove fatal.

In the mild cases of periostitis it is by no means easy to determine its presence positively, for there are no special symptoms by which it may be distinguished from pure laminitis. In the majority of the acute cases, though, which show no signs of improvement by the fifth to seventh day, it is safe to suspect periostitis is present, particularly if the coronets are very hot, the pulse remaining full and hard, and the lameness acute. In the fortunately rare cases where the bone is affected with inflammation and suppuration, the agony of the patient is intense; he occupies the recumbent position almost continually, never standing for more than a few minutes at a time, suffers from the most careful handling of the affected feet; maintains a rapid pulse and respiration, high temperature, loss of appetite, and great thirst. It is in these cases the patient continually grows worse, and the appearance of suppuration at the top of the hoof in about two weeks after the inception of the disease proves the inefficiency of any treatment that may have been adopted and the hopelessness of the case. These patients die usually between the tenth and twentieth days, either from exhaustion or pyæmic infections.

Gangrene occurs in the periosteum as the result of excessive detachment from the bone, combined with compression from an overprofuse exudate. Other parts of the sensitive tissues are subject to the same fate occasionally, from this last-named cause, and at times large territories will be found dead.

Pumiced sole is that condition in which the horny sole in the neighborhood of the toe readily crumbles away and leaves the sensitive tis-

sues more or less exposed. It is not confined to being a complication of laminitis, but may be seen whenever the necessary conditions for inducing it are present. Williams has described the horny-tissue under these circumstances as being "weak, cheesy, or spongy, like macerated horn, or even grumous," and this certainly conveys a good idea of its appearance and general characteristics. This crumbling horn when critically examined shows almost an entire absence of the cohesive matter which unites the healthy fibers, while the fibers themselves are irregular and granular in appearance. Pumiced sole depends upon an impairment of the horn-secreting powers of the sensitive sole, or upon a separation occurring between the horny and soft tissues which maintain its vitality. The normal sole physiologically maintains a proper thinness by crumbling off in scales as it passes beyond the life-maintaining influence of the producing tissues, and anything which prevents, suspends, or destroys this influence causes the crumbling process to become excessive.

Punctured wounds of the feet, where accompanied by any considerable destruction of the soft or horn-secreting tissues, present the same peculiarities in this respect in the immediate neighborhood of the injury. Bruises of the sole are occasionally followed by this change in the horn where the exudation has been excessive and has separated it from the living tissues. True, in these cases we rarely see the soft tissues laid bare, for the reason that new horn is constantly secreted and replaces that undergoing the process of disintegration.

Laminitis presents three different conditions under which pumiced sole may appear: First, where free exudation separates the horn from the other tissues, or where the process of inflammation arrests the production of horn by impairing or destroying the horn-secreting membrane: secondly, where depression of the coffin bone causes pressure upon and arrests the formation of horn; and, thirdly, where the elevation of the sole compresses the soft tissues against the pedal bone and induces the same condition. Pumiced sole, as it results from simple exudation and separation of tissues, is of no importance, for the reason given above in connection with bruises; but where suppuration occurs in restricted portions of the foot in conjunction with laminitis it always lays bare the tissues beneath and impairs the animal's value temporarily. In these cases recovery takes place after a few weeks' time by the tissues horning over, as in injuries which have been attended with the same process. Depression of the coffin bone is not a sufficient cause within itself to cause pumiced sole, for if the relative change in the bone takes place slowly, or if the horn is thin, the sole becomes convex from the gradual pressure and the soft tissues adapt themselves to the change without having their function materially impaired. But when the dropping is sudden and the soft tissues entirely destroyed, the horn rapidly crumbles away and the toe of the bone comes through. In many of these cases the soft tissues remain uncovered for months, and when they eventually become covered it is with a thin, slightly ad-

herent horn that bears but little or no wear. The sole being now convex the diseased tissues are compelled to bear unusual weight by coming in contact with the ground, and hence it is these animals are generally incurable cripples. In the majority of cases where the sole is raised to meet the pedal bone and pumiced sole occurs, it is due not to pressure of the bone from within (for the tissues are capable of adapting themselves to the gradual change), but to impaired vitality of the sensitive tissues from the inflammation and the constant concussion and pressure applied from without during progression. Added to this is to be considered the paring away of the horn by the smith when applying the shoe, thereby keeping the sole at this point too thin.

Turning up of the toe.—In many cases of laminitis which have become chronic it is found that the toe of the foot turns up, and that the heels are longer than natural, while the whole hoof next to the coronary band is circled with ridges like the horn of a ram. Even in other cases where recovery has taken place, and in other diseases than laminitis, these may be found in the wall of the foot, but in these cases the ridges are equally distant from each other all around the foot, while in turning up of the toe the ridges are wide apart at the heels and close together in front, as seen in the figure (Plate XXXI, Fig. 4). These ridges are produced by periods of interference with the growth of horn alternating with periods during which a normal or nearly normal growth takes place. When the toe turns up it does so because the coronary band in front produces horn very slowly, while at the heels it grows much faster.

Animals affected with pumiced foot and turning up of the toe during progression always place the abnormally long heel first upon the ground, not because the heel is too long, nor as in acute or subacute laminitis to relieve the pain, but for the simple reason that the animal carries the leg forward with the column of bones in the normal position, and attempting to keep them so the heel first comes in contact with the ground, and he then knuckles over at the fetlock in proportion to the amount of foot deformity present as he brings the toe to the surface.

The pain and impairment of function in these cases always result in marked atrophy of the muscles of the forearm and shoulder, and to some extent of the pectorals, while the position of the fore feet advances the scapula joints so far forward as to cause a somewhat sunken appearance of the chest in front, which the laity recognize as a peculiar form of the disease popularly designated as "chest founder."

Regarding the presence of inflammation during this process, there is no doubt a chronic form exists a long time after these lesions commence, yet it may in time subside and leave the feet free from fever while the other changes still go on.

The lesions of turning up of the toe are permanent, and are withal the most interesting pathologically of all the complications of laminitis.

Treatment.—The treatment of laminitis is probably more varied than in other disease, and yet in spite of it a large number of cases recover

for even the poorest practitioner. Since there are two objects to be attained in treatment—prevention and remedy—the matter will be considered under the head of prevention and curative measures.

Prevention.—To guard against and prevent disease, or to render an unpreventable attack less serious than it otherwise would be, is the highest practice of the healing art. In a disease so prone to result from the simplest causes as seen in laminitis, and especially when the soundest judgment may not be able to determine the extent of the disease-resisting powers of the tissues which are liable to be affected, or of what shall in every instance constitute an over-excitement, it is not strange that horse owners find themselves in trouble from unintentional transgression. If the disease was dependent upon specific causes, or if the stability of the tissues were of a fixed or more nearly determinate quality, some measures might be instituted that would prove generally preventive. But when we recall the fact that predisposing causes are so prevalent and often can not be remedied, that what is but gentle work in one instance may incite disease in another, that what is food to-day may to-morrow prove disastrous to health, and that necessary medical interference, no matter how judicious, may cause a more serious complaint than that which was being treated, the obstacles to contend with become plain. Notwithstanding these difficulties there are some general rules to be observed that will in part serve to prevent the development of an unusual number of cases. In the first place all the predisposing causes named must be removed where possible, and when this is impossible unusual care must be taken not to bring into operation an exciting cause. Fat animals should, under no circumstances, have hard work, and if the weather is warm or the variation of temperature great they should have but slow, gentle labor until they become inured to it, the tissues hardened and their excitability reduced to a minimum. Green horses should always have moderate work for the same reason, and particularly when changed from the farm and dirt roads to city pavements. The increased concussion, changed hygienic conditions and artificial living, readily become active causes of the disease under these circumstances. Army horses just out of winter quarters, track horses with insufficient preparation, and farmers' horses put to work in the spring, are among the most susceptible classes, and must be protected by work that is easy and gradual. If long marches or drives are imperative, then the incumbrances must be light as possible and the journey interspersed with frequent rests, for this allows the laminæ to regain their impaired functional activity and thereby to withstand much more work without danger. And, furthermore, it permits an early detection of an oncoming attack; in any case prevents working after the disease begins and renders subsequent medication much more effective by cutting the process short at the stage of congestion.

All animals when resting immediately after work should be protected from cold air or draughts. If placed in a stable that is warm and without draught no covering is necessary; under opposite conditions blankets

should be used until the excitement and exhaustion of the labor performed have entirely passed away. It is still better that all animals coming in warm from work be "cooled out" by slow walking until the perspiration has dried and the circulation and respiration returned to the normal. Animals stopped on the road even for a few moments time should always be protected from rapid change of temperature by appropriate clothing. If it can be avoided horses that are working should never be driven or ridden through a stream or pool of water. Where necessary they should be cooled off before passing through, and then kept exercising until completely dried. The same rule is to be observed with regard to washing the legs in cold water when the animal is just in from work, for, although it is practiced extensively and usually with impunity, occasionally it proves the cause of a most acute attack of this disease. Regarding shoeing as a predisposing cause, unusual changes in the manner of applying the shoe should not be hastily made.

If a plane shoe has been worn, high heels or toes must not be substituted at once, but the change, if necessary, should gradually be made, so that the different tissues may adapt themselves to the change of functional performance they are called upon to bear. If, on the other hand, such changes are imperative, as is sometimes the case, then the work must be so reduced in quantity and quality that it can not prove excitant of the disease. Laminitis from the effects of purgative medicines is a condition which can scarcely be guarded against unless we discard entirely this useful class of medicines. I can not determine from the few cases in which I have seen this unhappy result of a purgative that there are any conditions of the system present that would warn us of danger in this direction. The disease does not seem to have any dependence for inception in such cases upon the size of the purgative, the length of time before purgation begins, or the activity and severity with which the remedy acts. Moderate doses of medicines known to have unusual irritating effects on the alimentary canal should be used only when necessity demands it.

Experience alone will determine what animals are liable to suffer from this disease through the influence of the different foods. When an attack can with any certainty be ascribed to any particular food it should ever be withheld unless in the smallest quantities. Horses that have never been fed upon Indian corn should receive but a little at a time at first, and always mixed with bran, oats, or other food, until it has been determined that no danger exists. Corn is much more liable to cause laminitis in warm than in cold weather, and for this reason it should always be fed with care during spring and summer months.

When an animal is excessively lame in one foot the other or opposite member should have the shoe early removed and cold water frequently applied. At the same time the slings should be used if the subject remains standing. Horses should under no circumstances be overworked; to guard against this, previous work, nature of roads, state of weather, and various other influences must be carefully noted. Watering while

warm is a pernicious habit, and unless the animal is accustomed to it is apt to result in some disorder, ofttimes in laminitis.

Curative measures.—In cases of simple passive congestion of the laminæ, the body should be warmly clothed and warm drinks given to draw the blood in increased quantity to these parts so as to direct it from the feet; at the same time the feet should be placed in warm water so as to increase the return flow of blood. In the course of half an hour the feet may be changed to cold water, which serves as a tonic to all the tissues, and kept there until recovery is completed. If the constitutional symptoms demand it, diuretics should be given. Half-ounce doses of saltpeter, three times a day in the water, answers the purpose. In cases of active congestion the warm foot baths should be omitted and cold ones substituted from the commencement. Subacute laminitis demands the same treatment with laxatives if there is constipation, and the addition of low-heeled shoes. The diuretics may need to be continued for some time and their frequency increased. Regarding acute Laminitis, what has been called the "American treatment" is so simple and withal so efficient that it is to be remarked other countries have never adopted it. Since the disease is a local one, unquestionably the remedies used should be applied in the immediate neighborhood of the affected parts, or if drugs are administered internally, they should have some specific localized action. And such are the claims made for the above-named method of treatment. It consists solely in the exhibition of large doses of nitrate of potash and the continued application to the feet and ankles of cold water.

Three to 4 ounces of saltpeter in a pint of water, repeated every six hours, is the proper dose, and the laminitis frequently subsides inside of a week's time. These large doses may be continued for a week without danger; never under any circumstances have I seen the kidneys irritated to excess or other unfavorable effects produced.

The feet should either be kept in a tub of water at a temperature of 45° to 50° Fahr. (it may be lowered if desired), or if the animal is lying down swabs should be used and wet every half hour with the cold water. The water not only keeps the horn soft and moist, but acts directly upon the inflamed tissues by reducing their temperature, thereby increasing their vitality and disease-resisting qualities, and at the same time by toning up the coats of the blood vessels diminishes the supply of blood and limits the exudation. Furthermore, cold has also an anesthetic effect upon the diseased tissues and relieves the pain.

Aconite may be given in conjunction with niter where the heart is greatly excited and beating strongly. Ten-drop doses repeated every two hours for twenty-four hours is sufficient. The practice of giving cathartics is dangerous, for it may excite superpurgation. Usually the niter has sufficient effect upon the constipation to relieve it, yet if it should prove obstinate laxatives may be carefully given. Bleeding, both general and local, should be guarded against. The shoes should always be early removed and the soles left unpared.

Paring of the soles presents two objections. First, while it may temporarily relieve the pain by relieving pressure, it at the same time allows of greater exudation, which may more than counterbalance the good effects. Secondly, it makes the feet tender and subject to bruises when the animal again goes to work. The shoes should be replaced when convalescence sets in and the animal is ready to take exercise. Exercise should never be enforced until the inflammation has subsided, for although it temporarily relieves the pain and soreness, it serves to maintain continued irritation, increases the exudation, and prolongs the recovery.

If, at the end of the fifth or sixth day, prominent symptoms of recovery are not apparent, apply a stiff blister of cantharides around the coronet and omit the niter for about forty-eight hours. As soon as the blister has drawn well the feet may again receive wet swabs. If one blister does not suffice to remove the soreness, as is the case sometimes, especially where periostitis is present, it may be repeated, or the actual cautery applied. The same treatment should be adopted where side bones form or inflammation of the coronet bone ensues. When the sole breaks through and exposes the coffin bone and soft tissues, the feet must be carefully shod with thin heels and thick toes where there is any tendency to walking on the heels, and the sole well protected with appropriate dressing and pressure over the exposed parts. When there is turning up of the toe, blistering of the coronet in front, carefully avoiding the quarters and heels, sometimes stimulates the growth of horn, but as a rule judicious shoeing is the only treatment that will keep the animal in a condition to do light, slow work.

Where suppuration of the laminæ is profuse it is better to destroy your patient at once and relieve his suffering, but if the suppuration is limited to a small extent of tissue, especially of the sole, treatment as in acute cases may induce recovery and should always be tried. If from bed-sores or other causes septicæmia or pyæmia is feared, the bisulphite of soda in half-ounce doses may be given in conjunction with tonics and other treatment indicated in these diseases. Regarding enforced recumbency I doubt the propriety of insisting on it in the majority of cases, for I think as a rule the animal assumes whatever position gives comfort. There can be no doubt that recumbency diminishes the amount of blood sent to the feet, and that the suffering is greatly relieved while in this position, so that the experiment of forcing the patient to lie down may be tried, yet should not be renewed if it thereafter persists in standing.

Where the animal stands, or where constant lying indicates it, to prevent extensive sores the patient should be placed in slings, and the weight supported in this manner to the relief of the feet. When all four feet are affected it may be impossible to use slings, for the reason that the patient refuses to support any of his weight on his feet and simply hangs in them. Lastly, convalescent cases must not be returned to work too early, else permanent recovery may never be effected.

2 3 4 PLATE XXIX.

Haines, del. from Auzoux Model.

ANATOMY OF FOOT.

Sackett & Wilhelms Litho Co N.Y.

PLATE XXX.

Front *Flexor tendon* 5 *bone*

Wall *Suspensory ligament*

Sesamoid bone

Coffin bone

Flexor perforatus tendon

Laminar or Keratophyllus tissue

Inside of hoof

Haines, del. Nos. 1, 2 and 3, from model. No. 4, from nature. No. 5, after Hering (Colored).

ANATOMY OF FOOT.

Foundered foot,
after Haubner.

Medium section,
after Percivall.

Skeleton of hoof showing cavity occupied by the foot,
Original.

Same foot as shown in fig. 1,
(Original)

Haines, del.

Same foot as shown in fig. 5,
Original

Bottom of foot shown in fig. 6,
(Original)

FOUNDERED FEET.

Sackett & Wilhelms Litho Co. N.Y.

Ring Bone,
after Dadd

Anatomy of the foot,
after Haubner.

Side Bones,
after Stonehenge

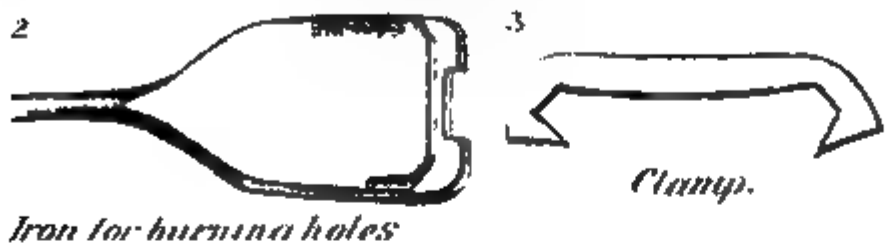
Navicular disease,
after Stonehenge

Haines, del

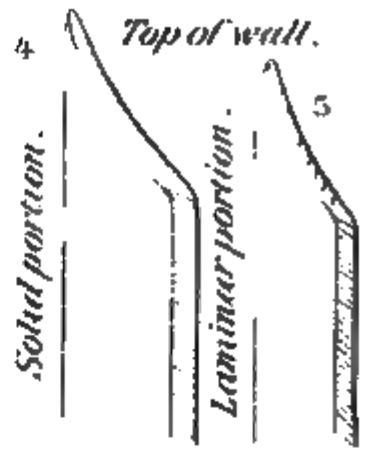
Secretan & Wilhelm Litho Co N.Y.

RING BONE AND NAVICULAR DISEASE.

PLATE XXXIII.



Iron for burning holes



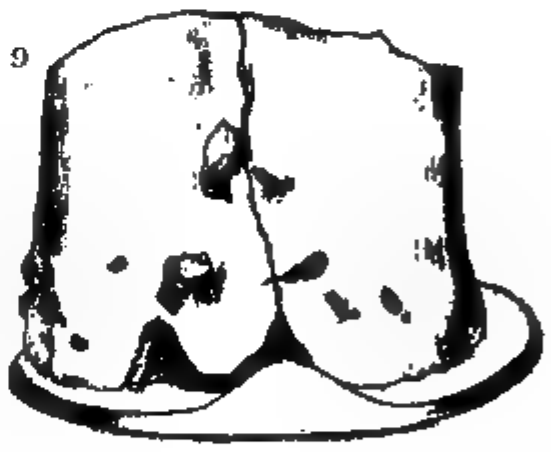
Actual thickness of walls of hoof.

6

7

Quarter-crack with cross cut.

The clamp and nail remedies applied.



Treated by clamping with nails.

Toe crack Wall removed to show absorption of coffin bone

1

Cracked walls

One effect of Quarter Crack.

Haines.del.

Sackett & Wilhelms Litho Co N.Y.

QUARTER CRACK AND REMEDIES.

PLATE XXXIV

1, 2 and 3, *Sound foot of two year old*

1

x x

b b a

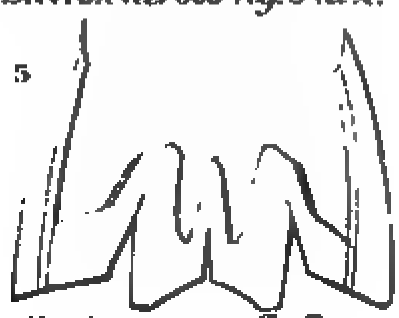
a, Nail properly driven.
b, Nail improperly driven.

3

4·a *Section across fig. 2, at x.*

Section across fig. 6 at x.

5



Section across fig. 7 at x.

Contracted foot.

x x

x x

Sound but flat foot.

Badly contracted foot.

Hamnes, del

Sachse & Waltzmann, Litho Coll.

SOUND AND CONTRACTED FEET.

DISEASES OF THE SKIN.

By JAMES LAW, F. R. C. S. V. S.,
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As we find them described in systematic works, the diseases of the skin are very numerous and complex, which may be largely accounted for by the fact that the cutaneous covering is exposed to view at all points, so that shades of difference in inflammatory and other diseased processes are easily seen and distinguished from each other. In the horse the hairy covering serves to some extent to mask the symptoms, and hence the nonprofessional man is tempted to apply the term "mange" to all alike, and it is only a step further to apply the same treatment to all these widely different disorders. Yet even in the hairy quadruped the distinction can be made in a way which can not be done in disorders of that counterpart and prolorgation of the skin—the mucous membrane, which lines the air passages, the digestive organs, the urinary, and generative apparatus. Diseased processes, therefore, which in these organs it might be difficult or impossible to distinguish from each other, can usually be separated and recognized when appearing in the skin.

Nor is this differentiation unimportant. The cutaneous covering presents such an extensive surface for the secretion of cuticular scales, hairs, horn, sebaceous matter, sweat, and other excretory matters, that any extensive disorder in its functions may lead to serious internal disease and death. Again, the intimate nervous sympathy of different points of the skin with particular internal organs renders certain skin disorders causative of internal disease and certain internal diseases causative of affections of the skin. The mere painting of the skin with an impermeable coating of glue is speedily fatal; a cold draught striking on the chest causes inflammation of the lungs or pleura; a skin eruption speedily follows certain disorders of the stomach, the liver, the kidneys, or even the lungs; simple burns of the skin cause inflammations of internal organs, and inflammations of such organs cause in their turn eruptions on the skin. The relations—nervous, secretory, and absorptive—between the skin and internal organs are most extensive and varied, and therefore a visible disorder in the skin may point at

once and specifically to a particular fault in diet, to an injudicious use of cold water when the system is heated, to a fault in drainage, ventilation or lighting of the stables, to indigestion, to liver disease, to urinary disorder, etc.

STRUCTURE OF THE SKIN.

The skin consists primarily of two parts: (1), the superficial nonvascular (without blood vessels) layer, the cuticle or epidermis; and (2), the deep vascular (with blood vessels) layer, the corium, dermis or true skin.

The *cuticle* is made up of cells placed side by side and more or less modified in shape by their mutual compression and by surface evaporation and drying. The superficial stratum consists of the cells dried in the form of scales, which fall off continually and form dandruff. The deep stratum (the mucous layer) is formed of somewhat rounded cells with large central nuclei, and in colored skin containing numerous pigment granules. These cells have prolongations or branches by which they communicate with each other and with the superficial layer of cells in the true skin beneath. Through these they receive nutrient liquids for their growth and increase, and through these liquids absorbed by the skin, may be passed on into the vessels of the true skin beneath. The living matter in the cells exercises an equally selective power on what they shall take up for their own nourishment and on what they shall admit into the circulation from without. Thus, certain agents like iodine and belladonna are readily admitted, whereas others, like arsenic, are excluded by the sound unbroken epidermis. Between the deep and superficial layers of the epidermis there is a thin translucent layer (septum lucidum), consisting of a double stratum of cells, and forming a medium of transition from the deep spheroidal to the superficial scaly cuticle.

The *true skin* or *dermis* has a framework of interlacing bundles of white and yellow fibers, large and coarse in the deeper layers, and fine in the superficial where they approach the cuticle. Between the fibrous bundles are left interspaces which, like the bundles, become finer as they approach the surface, and inclose cells, vessels, nerves, glands, gland ducts, hairs, and in the deeper layers fat.

The superficial layer of the dermis is formed into a series of minute conical elevations or *papilla*, projecting into the deep portion of the cuticle, from which they are separated by a very fine transparent membrane. This *papillary layer* is very richly supplied with capillary blood vessels and nerves, and is at once the seat of acute sensation and the point from which the nutrient liquid is supplied to the cells of the cuticle above. It is also at this point that the active changes of inflammation are especially concentrated; it is the immediately superposed cell layers (mucous), that become morbidly increased in the early stages of inflammation; it is on the surface of the papillary layer that the liquid is thrown out which raises the cuticle in the form of a blister, and it is at this point mainly that pus forms in the ordinary pustule.

The fibrous bundles of the true skin contain plain muscular fibers, which are not controlled by the will, but contract under the influence of cold and under certain nervous influences, as in some skin diseases and in the chill of a fever, and lead to contraction, tightening, or corrugation of the skin, contributing to produce the "hidebound" of the horseman. Other minute muscular filaments are extended from the surface of the dermis to the hair follicle on the side to which the hair is inclined, and under the same stimulating influences produce that erection of the hair which is familiarly known as "staring coat." Besides these, the horse's skin is furnished with an expansion of red voluntary muscle, firmly attached to the fibrous bundles, and by which the animal can not only dislodge insects and other irritants, but even shake off the harness. This fleshy envelope covers the sides of the trunk and the lower portions of the neck and head, the parts unprotected by the mane and tail, and serves to throw the skin of these parts into puckers or ridges in certain irritating skin diseases.

The *hairs* are cuticular products growing from an enlarged papilla lodged in the depth of a follicle or sack, hollowed out in the skin and extending to its deepest layers. The hair follicle is lined by cells of epidermis, which at the bottom are reflected on the papilla and become the root of the hair. The hair itself is formed of the same kind of cells firmly adherent to each other by a tough intercellular substance, and overlapping each other like slates on a roof in a direction towards the free end.

The *sebaceous glands* are branching tubes ending in follicles or sacks and opening into the hair follicles, lined by a very vascular fibrous network representing the dermis, and an internal layer of cells representing the mucous layer of the cuticle. Their oily secretion gives gloss to the hair and prevents its becoming dry and brittle, and keeps the skin soft and supple, protecting it at once against undue exhalation of water and undue absorption when immersed in that medium. Beside those connected with the hair follicles there are numerous isolated sebaceous glands, opening directly on the surface of the skin, producing a somewhat thicker and more odorous secretion. These are found in large numbers in the folds of the skin, where chafing would be likely if the surface were dry, as on the sheath, scrotum, mammary glands and inner side of the thigh, around the anus and vulva, in the hollow of the heel, beneath the fine horn of the frog, on the inner side of the elbow, on the lips, nostrils, and eyelids. When closed by dried secretion or otherwise these glands may become distended so as to form various sized swellings on the skin, and when inflamed they may throw out offensive liquid discharges as in "grease," or produce red tender fungus growths ("grapes").

The *sweat glands* of the horse, like those of man, are composed of simple tubes, which extend down through the cuticle and dermis in a spiral manner, and are coiled into balls in the deeper layer of the true

skin. In addition to their importance in throwing offensive waste products out of the system, these glands tend to cool the skin and the entire economy of the animal through the evaporation of their watery secretion. Their activity is therefore a matter of no small moment, as beside regulating the animal heat and excreting impurities, it influences largely the internal organs through the intimate sympathy maintained between them and the skin.

Diseases of the skin may be conveniently divided, according to their most marked features, into:

(1) Those in which *congestion* and *inflammation* are the most marked features, varying according to the grade or form into (*a*), *congestion* with simple redness, dryness and heat, but no eruption (*erythema*); (*b*), *inflammation* with red pointed elevations but no blisters (*papules*); (*c*), *inflammation* with fine conical elevations, each surmounted by a minute blister (*vesicle*); (*d*), *inflammation* with a similar eruption but with larger blisters, like half a pea and upwards (bullæ); (*e*), *inflammation* with a similar eruption but with a small sack of white creamy pus on the summit of each elevation (*pustules*); (*f*), the formation of pustules implicating the superficial layer of the true skin, a small portion of which dies and is thrown off as a slough or "core" (*boils*); (*g*), the formation of round, nodular, transient swellings in the true skin (*tubercles*) and (*h*), the excessive production of scales or dandruff (*scaly or squamous affections*.

(2) Diseases in which there is only deranged sensations, of itching, heat, tenderness, etc. (*Neurosis*).

(3) Diseased growths, as warts, callosities, horny growths, cancer, etc.

(4) Diseases due to parasites, animal and vegetable.

(5) Diseases connected with a specific poison—horsepox, erysipelas, anthrax, farcy or cutaneous glanders, etc.

(6) Physical injuries like wounds, burns, scalds, etc.

CONGESTION—RED EFFLORESCENCE—ERYTHEMA.

This is a congested or slightly inflamed condition of the skin, unattended by any eruption. The part is slightly swollen, hot, tender or itchy, and dry, and if the skin is white there is redness. The redness is effaced by pressure, but reappears instantly when the pressure is removed. Unless in transient cases the hairs are liable to be shed. It may be looked on as the first stage of inflammation, and therefore when it becomes aggravated it may merge in part or in whole into a papular, vesicular, or pustular eruption.

Erythema may arise from a variety of *causes*, and is often named in accordance with its most prominent cause. Thus the *chilling* or partial *freezing* of a part will give rise to a severe reaction and congestion. Where snowy or icy streets have been salted this may extend to severe inflammation with vesicles, pustules, or even sloughs of circumscribed portions of the skin of the pastern (chill-blain, frost-bite). Heat and

burning has a similar effect, and this often comes from exposure to the direct rays of the sun. The skin that does not perspire is the most subject, and hence the *white face* or *white limb* of a horse becoming dried by the intensity of the sun's rays often suffers to the exclusion of the rest of the body (*white face and foot disease*). The febrile state of the general system is also a potent cause, hence the white-skinned horse is rendered the more liable if kept on a heating ration of *buckwheat*, or even of *wheat* or *maize*. Contact of the skin with oil of *turpentine* or other *essential oils*, with *irritant liquids*, vegetable or mineral, with *rancid fats*, with the acrid secretions of certain animals like the *irritated toad*, with *pus*, *sweat*, *tears*, *urine* or *liquid fæces*, will produce congestion or even inflammation. *Chafing* is a common cause, and is especially liable to affect the fat horse between the thighs, by the side of the sheath or scrotum, on the inner side of the elbow, or where the harness chafes on the poll, shoulder, back, breastbone, and under the tail. The accumulation of sweat and dust between the folds of the skin, and on the surface of the harness, and the specially acrid character of the sweat in certain horses contribute to chafing or "intertrigo." The heels often become congested, owing to the irritation caused by the short bristly hairs in *clipped heels*. Again, congestion may occur from friction by halter, harness, or other foreign body under the pastern, or inside the thigh or arm, or by reason of blows from another foot (cutting, interfering, overreach). Finally, erythema is especially liable to occur in spring when the coat is being shed, and the hair follicles and general surface are exposed and irritable in connection with the dropping of the hairs.

If due only to a local irritant congestion will usually disappear when such cause has been removed, but when the feeding or system is at fault these conditions must be first corrected. While the coat is being shed the susceptibility will continue, and the aim should be to prevent the disease developing and advancing so as to weaken the skin, render the susceptibility permanent, and lay the foundation of persistent or frequently recurring skin disease. Hence at such times the diet should be nonstimulating; any excess of grain and above all of buckwheat, Indian corn, or wheat being avoided. A large grain ration should not be given at once on return from hard work, when the general system and stomach are unable to cope with it; the animal should not be given more than a swallow or two of cold water when perspiring and fatigued; nor should he be allowed a full supply of water just after his grain ration; he should not be overheated nor exhausted by work, nor should dried sweat and dust be allowed to accumulate on the skin nor on the harness pressing on it. The exposure of the affected heels to damp, mud, and snow, and above all to melting snow, should be guarded against; light, smooth, well-fitting harness must be secured, and where the saddle or collar irritates an incision should be made above and one below the part that chafes, and the padding between having been removed, the lining should be beaten so as to make a hollow. A zinc shield in

the upper angle of the collar will often prevent chafing in front of the withers.

Wash the chafed skin and apply salt water (one-half ounce to the quart), extract of witch-hazel, a weak solution of oak bark or camphorated spirit. If the surface is raw use bland powders, as oxide of zinc, lycopodium, starch, or smear the surface with vaseline, or with 1 ounce vaseline intimately mixed with one-half dram each of sugar of lead and opium. In cases of chafing rest must be strictly enjoined. Where there is constitutional disorder or acrid sweat 1 ounce cream of tartar or a teaspoonful of bicarbonate of soda may be given twice daily.

CONGESTION, WITH SMALL PIMPLES—PAPULES.

In this affection there is the general blush, heat, etc., of erythema, together with a crop of elevations from the size of a poppy-seed to a coffee-bean, visible when the hair is reversed or to be felt with the finger where the hair is scanty. In white skins they vary from the palest to the darkest red. All do not retain the papular type, but some go on to form blisters (eczema, bullæ), or pustules, or dry up into scales, or break out into open sores, or extend into larger swellings (tubercles). The majority, however, remaining as pimples, characterize the disease. When very itchy the rubbing breaks them open, and the resulting sores and scales hide the true nature of the eruption.

The general and local *causes* may be the same as for erythema, and in the same subject one portion of the skin may have simple congestion and another adjacent papules. As the inflammatiory action is more pronounced, so the irritation and itching are usually greater, the animal rubbing and biting himself severely. This itching is especially severe in the forms which attack the roots of the mane and tail, and there the disease is often so persistent and troublesome that the horse is rendered virtually useless.

The bites of insects often produce a papular eruption, but in many such cases the swelling extends wider into a button-like elevation, one-half to an inch in diameter. The same remarks apply to the effects of the poison ivy and poison sumac.

In papular eruption first remove the cause, then apply the same general remedies as for simple congestion. In the more inveterate cases use a lotion of one-half ounce sulphide of potassium in 2 quarts water, to which a little Castile soap has been added. Or use a wash with one-half ounce oil of tar, 2 ounces Castile soap, and 20 ounces water.

INFLAMMATION WITH BLISTERS—ECZEMA.

In this the skin is congested, thickened, warm (white skins are reddened), and shows a thick crop of little blisters formed by effusions of a straw-colored fluid between the true skin and the cuticle. The blisters may be of any size from a millet seed to a pea, and often crack

open and allow the escape of the fluid which concretes as a slightly yellowish scab or crust around the roots of the hairs. This exudation and incrustation are especially common where the hairs are long, thick, and numerous, as in the region of the pastern of heavy draught horses. Eczema may appear on any part of the body, but in horses it is especially common on the heels and the lower parts of the limbs, and less frequently on the neck, shoulder, and abdomen. The limbs appear to be especially liable because of their dependent position, all blood having to return from them against the action of gravity, and congestions and swellings being common, because of the abundance of blood vessels in this part of the skin, and because of the frequent contact with the irritant dung and urine and their ammoniacal emanations. The legs further suffer from contact with wet and mud when at work, from snow and ice, from draughts of cold air on the wet limbs, from washing with caustic soaps, or from the relaxing effects of a too deep and abundant litter. Among other causes may be named indigestions and the presence of irritant matters in the blood and sweat, the result of patent-medicated foods and condition powders (aromatics, stimulants), green food, new hay, new oats, buckwheat, wheat, maize, diseased potatoes, smut or ergot in grains, decomposing green food, brewer's grains, or kitchen garbage. The excitement in the skin, caused by shedding the coat, lack of grooming, hot weather, hot boiled or steamed food, conduces to the eruption. Lastly, any sudden change of food may induce it.

The blisters may in part go on to suppuration so that vesicles and pustules often appear on the same patch, and when raw from rubbing the true nature of the eruption may be completely masked. In high-fed horses, kept in close stables with little work, eczema of the limbs may last for months and years. It is a very troublesome affection in draught stallions.

Treatment.—This disease is so often the result of indigestion that a laxative of 1 pound Glauber's salts in 3 or 4 quarts water, or 1½ pints olive oil is often demanded to clear away irritants from the alimentary canal. Following this, in recent and acute cases, give 2 drams of acetate or bicarbonate of potash twice a day in the drinking water. If the bowels still become costive give daily 1 ounce sulphate of soda and 20 grains powdered nux vomica. In debilitated horses combine the nux vomica with one-half ounce powdered gentian root. As a wash for the skin use 1 dram bicarbonate of soda and 1 dram carbolic acid in a quart of water, after having cleansed the surface with tepid water. Employ the same precautions as regards feeding, stabling, and care of harness as in simple congestion of the skin.

In the more inveterate forms of eczema more active treatment is required. Soak the scabs in fresh sweet oil, and in a few hours remove these with tepid water and castile soap; then apply an ointment of sulphur or iodide of sulphur day by day. If this seems to be losing its effect after a week, change for mercurial ointment or a solution of sul-

phide of potassium, or of hyposulphite of soda, 3 drams to the quart of water. In these cases the animal may take a course of sulphur (1 ounce daily), bisulphite of soda (½ ounce daily), or of arsenic (5 grains daily) mixed with 1 dram bicarbonate of soda.

INFLAMMATION WITH PUSTULES.

In this affection the individual elevations on the inflamed skin show in the center a small sack of white, creamy pus, in place of the clear liquid of a blister. They vary in size from a millet seed to a hazel nut. The pustules of glanders (farcy buds) are to be distinguished by the watery contents and the cord-like swelling, extending from the pustules along the line of the veins, and those of boils by the inflammation and sloughing out of a core of the true skin. The hair on the pustule stands erect, and is often shed with the scab which results. When itching is severe the parts become excoriated by rubbing, and, as in the other forms of skin disease, the character of the eruption may become indistinct. Old horses suffer mainly at the root of the mane and tail, and about the heels, and suckling foals around the mouth, on the face, inside the thighs, and under the tail.

Pustules like eczema are especially liable to result from unwholesome food and indigestion, from a sudden change of food, above all from dry to green food. In foals it may result from overheating of the mare and allowing the first milk after she returns, or by milk rendered unwholesome by faulty feeding of the dam. If a foal is brought up by hand the souring and other decompositions in the milk derange the digestion and cause such eruption. Vetches and other plants affected with honeydew and buckwheat have been the cause of these eruptions on white portions of the skin. Disorders of the kidneys or liver are common causes of this affection.

Treatment.—Apply soothing ointments, such as benzoated oxide of zinc, or vaseline with 1 dram oxide of zinc in each ounce. Or a wash of 1 dram sugar of lead or 2 drams hyposulphite of soda in a quart of water may be freely applied. If the skin is already abraded and scabby, smear thickly with vaseline for some hours, then wash with soapsuds and apply the above dressings. When the excoriations are indolent they may be painted with a solution of lunar caustic, 2 grains to 1 ounce of distilled water. Internally counteract costiveness and remove intestinal irritants by the same means as in eczema, and follow this with one-half ounce doses daily of hyposulphite of soda, and one-half ounce doses of gentian. Inveterate cases may often be benefited by a course of sulphur, bisulphite of soda, or arsenic. In all the greatest care must be taken with regard to food, feeding, watering, cleanliness, and work. In wet and cold seasons predisposed animals should, as far as possible, be protected from wet, mud, snow, and melted snow, above all from that which has been melted by salt.

BOILS—FURUNCLES.

These may appear on any part of the skin, but are especially common on the lower parts of the limbs, and on the shoulders and back where the skin is irritated by accumulated secretion and chafing with the harness. In other cases the cause is constitutional, or attended by unwholesome diet and overwork with loss of general health and condition. They also follow on weakening diseases, notably strangles, in which irritants are retained in the system from overproduction of effete matters during fever, and imperfect elimination. There is also the presence of a pyogenic bacterium, by which the disease may be maintained and propagated.

While boils are pus producing, they differ from simple pustule in affecting the deepest layers of the true skin, and even the superficial layers of the connective tissues beneath, and in the death and sloughing out of the central part of the inflamed mass (core). The depth of the hard, indurated, painful swelling, and the formation of this central mass or core, which is bathed in pus and slowly separated from surrounding parts, serve to distinguish the boil alike from the pustule, from the farcy bud, and from a superficial abscess.

To *treat* very painful boils a free incision with a lancet in two directions, followed by a dressing with one-half an ounce carbolic acid in a pint of water, bound on with cotton wool or lint, may cut them short. The more common course is to apply a warm poultice of linseed meal or wheat bran, and renew daily until the center of the boil softens, when it should be lanced and the core pressed out.

If the boil is smeared with a blistering ointment of Spanish flies and a poultice put over it, the formation of matter and separation of the core is often hastened. A mixture of sugar and soap laid on the boil is equally good. Cleanliness of the skin and the avoidance of all causes of irritation are important items, and a teaspoonful of bicarbonate of soda once or twice a day will sometimes assist in warding off a new crop.

NETTLERASH—SURFEIT—URTICARIA.

This is an eruption in the form of cutaneous nodules, in size from a hazel nut to a hickory nut, transient, with little disposition to the formation of either blister or pustule, and usually connected with shedding of the coat, sudden changes of weather, and unwholesomeness or sudden change in the food. It is most frequent in the spring and in young and vigorous animals (good feeders). The swelling embraces the entire thickness of the skin and terminates by an abrupt margin in place of shading off into surrounding parts. When the individual swellings run together there are formed extensive patches of thickened integument. These may appear on any part of the body, and may be general; the eyelids may be closed, the lips rendered immovable, or the nos-

trils so thickened that breathing becomes difficult and snuffling. It may be attended by constipation or diarrhea, or by colicky pains. The eruption is sudden, the whole skin being sometimes covered in a few hours, and it may disappear with equal rapidity or persist for six or eight days.

Treatment.—This consists in clearing out the bowels by 5 drams Barbadoes aloes, or 1 pound Glauber's salts, and follow the operation of these by daily doses of one-half ounce powdered gentian and 1 ounce Glauber's salts. A weak solution of alum may be applied to the swellings.

SCALY SKIN DISEASE—PITYRIASIS.

This affection is characterized by an excessive production and detachment of dry scales from the surface of the skin (dandruff). It is usually dependent on some fault in digestion, and an imperfect secretion from the sebaceous glands, and is most common in old horses with spare habit of body. Williams attributes it to food rich in saccharine matter (carrots, turnips), and the excretion by the skin of oxalic acid. He has found it in horses irregularly worked and well fed, and advises the administration of pitch for a length of time, and the avoidance of saccharine food. Otherwise the horse may take a laxative followed by dram doses of carbonate of potash, and the affected parts may be bathed with soft tepid water and smeared with an ointment made with vaseline and sulphur. In obstinate cases sulphur may be given daily in the food.

NERVOUS IRRITATION OF THE SKIN—PRURITUS.

This is seen in horses fed to excess on grain and hay, kept in close stables, and worked irregularly. Though most common in summer it is often severe in hot, close stables in winter. Pimples, vesicles, and abrasions may result, but as the itching is quite as severe on other parts of the skin, these may be the result of scratching merely. It is especially common and inveterate about the roots of the mane and tail.

Treatment consists in a purgative (Glauber's salts, 1 pound), restricted, laxative diet, and a wash of water slightly soured with oil of vitriol and rendered sweet by carbolic acid. If obstinate, give daily 1 ounce of sulphur and 20 grains nux vomica. If the acid lotion fails, 2 drams carbonate of potash and 2 grains of cyanide of potassium in a quart of water will sometimes benefit. If due to pin worms in the rectum, the itching of the tail may be remedied by an occasional injection of a quart of water in which chips of quassia wood have been steeped for twelve hours.

HERPES.

This name has been applied to a disease in which there is an eruption of minute vesicles in circular groups or clusters, with little tendency to burst but rather to dry up into fine scabs. If the vesicles break they exude a slight, gummy discharge which concretes into a small, hard scab. It is apparently noncontagious and not appreciably connected with any disorder of internal organs. It sometimes accompanies or follows specific fevers, and is on the whole most frequent at the seasons of changing the coat—spring and autumn. It is seen on the lips and pastern, but may appear on any part of the body. The duration of the eruption is two weeks or even more, the tendency being to spontaneous recovery. The affected part is very irritable, causing a sensitiveness and a disposition to rub, out of proportion to the extent of the eruption.

It may be *treated* by oxide of zinc ointment, and to relieve the irritation a solution of opium or belladonna in water, or of sugar of lead or oil of peppermint. A course of bitters (one-half an ounce Peruvian bark daily for a week) may be serviceable in bracing the system and producing an indisposition to the eruption.

BLEEDING SKIN ERUPTIONS—DERMATORRHAGIA PARASITICA.

In China, Hungary, Spain, and other countries horses frequently suffer from the presence of a thread worm (*Filaria hæmorrhagica*, (Railliet: *F. multipapullosa, Condamine*, Drouilly) in the subcutaneous connective tissue, causing effusions of blood under the scurf skin, and encrustations of dried blood on the surface. The eruptions, which appear mainly on the sides of the trunk, but may cover any part of the body, are rounded elevations about the size of a small pea, containing blood which bursts through the scurf skin and concretes like a reddish scab around the erect, rigid hairs. These swellings appear in groups, which remain out for several days, gradually diminishing in size; new groups appear after an interval of three or four weeks, the manifestation being confined to three or four months of spring and disappearing in winter. A horse will suffer for several years in succession, and then permanently recover. A fatal issue is not unknown. To find the worm the hair is shaved from the part where the elevations are felt, and as soon as a bleeding point is shown the superficial layer is laid open with the knife, when the parasite will be seen drawing itself back into the parts beneath. The worm is about 2 inches long and like a stout thread, thicker towards the head than towards the tail, and with numerous little conical elevations (papillæ) around the head. The young worms are numerous in the body of the adult female worm.

The worm has become common in given localities, and probably enters the system with food or water. Treatment is not satisfactory, but the affected surface should be kept clean by sponging, and the pressure of

harness on any affected part must be avoided. Thus rest may become essential. The part may be frequently washed with a strong solution of sulphide of potassium.

SUMMER SORES FROM FILARIA IRRITANS.

The summer sores of horses (*dermatitis granulosa*, boils) have been traced to the presence in the skin of another parasite, 3 millimeters in length and extremely attenuated (*Filaria irritans*, Railliet). The sores may be seen as small as a millet seed, but more frequently the size of a pea, and may become an inch in diameter. They may appear on any point, but are especially obnoxious where the harness presses or on the lower part of the limbs. They cause intense and insupportable itching, and the victim rubs and bites the part until extensive raw surfaces are produced. Aside from such friction the sore is covered by a brownish-red, soft, pulpy material with cracks or furrows filled with serous pus. In the midst of the softened mass are small, firm, rounded granulations, fibrinous, and even caseated, and when the soft pultaceous material has been scraped off the surface bears a resemblance to the fine yellow points of miliary tuberculosis in the lung. The worm or its débris is found in the center of such masses. These sores are very obstinate, resisting treatment for months in summer, and even after apparent recovery during the cold season they may appear anew the following summer. In bad cases the rubbing and biting may cause exposure of synovial sacs and tendons, and cause irremediable injury. Even in winter, however, when the diseased process seems arrested, there remains the hard, firm, resistant patches of the skin with points in which the diseased product has become softened like cheese.

The apparent subsidence of the disease in winter is attributed to the coldness and comparative bloodlessness of the skin, whereas in summer, with high temperature, active circulation, and rapid cell-growth, inflammation is increased, itching follows, and from the animal rubbing the part the irritation is persistently increased. The hotter the climate the more troublesome the disease.

The life history of the parasite is unknown, but it probably enters the system with the food or water.

Treatment consists, first, in placing the animal in a cool place and showering the surface with cold water. The parasite may be destroyed by rubbing the surface of the wound with iodoform, and covering it with a layer of collodion, and repeating the applications every twenty-four hours for fifteen days, or until the sores heal up. Ether or chloroform may be used in place of iodoform, being poured on cotton wool and applied to the sore for two minutes before painting it with collodion.

CRACKED HEELS—SCRATCHES—CHAPS ON KNEE AND HOCK.

This usually sets in with swelling, heat, and tenderness of the hollow of the heel, with erections of the hairs and redness (in white skins),

with stiffness and lameness, which may be extreme in irritable horses. Soon slight cracks appear transversely, and may gain in depth and width, and may even suppurate. More frequently they become covered at the edges or throughout by firm incrustations resulting from the drying of the liquids thrown out, and the skin becomes increasingly thick and rigid. A similar condition occurs behind the knee and in front of the hock (malanders and salanders), and may extend from these points to the hoof, virtually incasing that side of the limb in a permanent incrusting sheath. Besides a heavy lymphatic constitution, which predisposes to this affection, the *causes* are overfeeding on grain, altered unwholesome fodder, close, hot, dirty stables, constant contact with dung and urine and their emanations, working in deep, irritant mud; above all, in limestone districts, irritation by dry limestone or sandy dust in dry weather on dirt road, also cold draughts, snow and freezing mud, washing the legs with caustic soap, wrapping the wet legs in thick woolen bandages which soak the skin and render it sensitive when exposed next day, clipping the heels, weak heart and circulation, natural or supervening on overwork, imperfect nourishment, impure air, lack of sunshine, chronic, exhausting, or debilitating diseases, or functional or structural diseases of the heart, liver, or kidneys. These last induce dropsical swelling of the limbs (stocking), weaken the parts, and induce cracking. Finally the cicatrix of a preëxisting crack, weak, rigid, and unyielding, is liable to reopen under any severe exertion, hence rapid paces and heavy draft are active causes.

In *treatment* the first step is to ascertain and remove the cause whenever possible. If there is much local heat and inflammation a laxative (5 drams aloes, or 1 pound Glauber salts) may be given, and for the pampered animal the grain should be reduced or replaced altogether by bran mashes, flaxseed, and other laxative, noustimulating food. In the debilitated, on the other hand, nutritious food and bitter tonics may be given, and even a course of arsenic (5 grains arsenic with 1 dram bicarbonate of soda daily). When the legs swell exercise on dry roads, hand-rubbing, and evenly applied bandages are good, and mild astringents, like extract of witch-hazel may be applied and the part subsequently rubbed dry and bandaged. If there is much heat but unbroken skin, a lotion of 2 drams sugar of lead to 1 quart of water may be applied on a thin bandage, covered in cold weather with a dry one. The same may be used after the cracks appear, or a solution of sulphurous acid solution 1 part, glycerine 1 part, and water 1 part, applied on cotton and well covered by a bandage. In case these should prove unsuitable to the particular case, the part may be smeared with vaseline 1 ounce, sugar of lead 1 dram, and carbolic acid 10 drops.

INFLAMMATION OF THE HEELS FROM A FUNGUS—GREASE—CANKER.

This is a specific affection of the heels of horses, associated with the growth of a parasitic fungus (*Oidium batraçosis*, *dermavhyton*), an offen-

sive discharge from the numerous sebaceous glands and in bad cases the formation of red, raw, excrescences (*grapes*) from the surface. It is to be distinguished (1) from *simple inflammation*, in which the special, fetid discharge and the tendency to the formation of "grapes" are absent; (2), from *horsepox*, in which the abundant exudate forms a firm yellow incrustation around the roots of the hair, and is embedded at intervals in the pits formed by the individual pocks, and in which there is no vascular excrescence; (3), from *foot scabies* (mange), in which the presence of an acarus is distinctive; (4), from lymphangitis, in which the swelling appears suddenly extending around the entire limb as high as the hock, and on the inner side of the thigh along the line of the vein to the groin, and in which there is active fever, and (5), from *erysipelas*, in which there is active fever (wanting in grease), the implication of the deeper layers of the skin and of the parts beneath giving a boggy feeling to the parts, the absence of the fetid, greasy discharge, and finally a tendency to form pus loosely in the tissues without any limiting membrane as in abscess. Another distinctive feature of grease is its tendency to implicate the skin which secretes the bulbs or heels of the horny frog and in the cleft of the frog, constituting the disease known as canker.

The predisposing *causes* of grease are essentially the same as those of simple inflammation of the heel, so that the reader may consult the preceding article, and though the specific fungus (*Oidium batracosis*) is essential to the disease, yet it usually remains inoperative unless the field has been prepared by the coexistent predisposing factors. Local irritants may cause simple inflammation, and may be essential to the growth of the implanted germ, but without that germ it will not produce grease.

The *symptoms* vary according to whether the disease comes on suddenly or more tardily. In the first case there is a sudden swelling of the skin in the heel with heat, tenderness, itching, and stiffness, which is lessened during exercise. In the slower forms there is only seen a slight swelling after rest, and with little heat or inflammation for a week or more. Even at this early stage a slight serous oozing may be detected. As the swelling increases, extending up toward the hock or knees, the hairs stand erect, and are bedewed by moisture no longer clear and odorless, but grayish, milky, and fetid. The fetor of the discharge draws attention to the part whenever one enters the stable, and the swollen pastern and wet, matted hairs on the heel draw attention to the precise seat of the malady. If actively treated the disease may not advance farther, but if neglected the tense tender skin cracks open, leaving open sores from which vascular bleeding growths grow up, constituting the "grapes." The hair is shed, and the heel may appear but as one mass of rounded, red, angry excrescences which bleed on handling and are covered with the now repulsively fetid decomposing discharge. During this time there is little or no fever, the animal feeds

well, and but for its local trouble it might continue at work. When the malady extends to the frog there is a fetid discharge from its cleft, or from the depressions at its sides, and this gradually extends to its whole surface and upon the adjacent parts of the sole. The horn meanwhile becomes soft, whitish, and fleshy in aspect, its constituent tubes being greatly enlarged and losing their natural cohesion; it grows rapidly above the level of the surrounding horn, and when pared is found to be penetrated to an unusual depth by the secreting papillæ, and that at intervals these have bulged out into a vascular fungus mass comparable to the "grapes."

In *treatment* hygienic measures occupy a front rank, but are in themselves insufficient to establish a cure. All local and general conditions which favor the production and persistence of the disease must be guarded against. Above all, cleanliness and purity of the stable and air must be secured; also, nourishing diet, regular exercise, and the avoidance of local irritants—septic, muddy, chilling, etc. At the outset benzoated oxide of zinc ointment may be used with advantage. A still better dressing is made with 1 ounce vaseline, 2 drams oxide of zinc, and 20 drops iodized phenol. If the surface is much swollen and tender, a flaxseed poultice may be applied over the surface of which has been poured some of the following lotion: Sugar of lead, one-half ounce; carbolic acid, 1 dram; water, 1 quart. All the astringents of the pharmacopœia have been employed with more or less advantage, and some particular one seems to suit particular cases or patients. To destroy the grapes, they may be rubbed daily with strong caustics (copperas, blue stone, lunar caustic), or each may be tied round its neck by a stout waxed thread, or finally and more speedily they may be cut off by a blacksmith's shovel heated to redness, and applied with its sharp edge toward the neck of the excrescence, over a cold shovel held between it and the skin to protect it from the heat. The latter must be frequently dipped in water to cool it down. After the removal of the grapes the astringent dressing must be persistently applied to the surface. When the frog is affected it must be pared to the quick and dressed with dry caustic powders (quicklime, copperas, bluestone), or carbolic acid and subjected to pressure, the dressing being renewed every day at least.

ERYSIPELAS.

This is a specific contagious disease, characterized by spreading dropsical inflammation of the skin and subcutaneous tissues, attended by general fever. It differs from most specific diseases in the absence of a definite period of incubation, a regular course and duration, and a conferring of immunity on the subject after recovery. On the contrary, one attack of erysipelas predisposes to another, partly, doubtless, by the loss of tone and vitality in the affected tissues, but also, perhaps, because of the survival of the infecting germ. It is no longer to be doubted

that the microbes found in the inflammatory product are the true *cause* of erysipelas, as the disease can be successfully transferred from man to animals and from one animal to another by their means. This transition may be direct or through the medium of infected buildings or other articles. Yet from the varying severity of erysipelas in different outbreaks and localities it has been surmised that various different microbes are operative in this disease, and a perfect knowledge of these might perhaps enable us to divide erysipelas into two or more distinct affections. At present we must recognize it as a specific inflammation due to a bacterial poison and closely allied to septicæmia. Erysipelas was formerly known as *surgical* when it spread from a wound (through which the germ had gained access), and *medical* or *idiopathic* when it started independently of any recognizable lesion. Depending as it does, however, upon a germ distinct from the body the disease must be looked upon as one no matter by what channel the germ found an entrance. Erysipelas which follows a wound is usually much more violent than the other form, the difference being doubtless partly due to the lowered vitality of the wounded tissues and to the oxidation and septic changes which are invited on the raw, exposed surface. As apparently idiopathic cases may be due to infection through bites of insects, the small amount of poison inserted may serve to moderate the violence.

This affection may attack a wound of any part of the horse's body, while apart from wounds it is most frequent about the head and the hind limbs. It is to be distinguished from ordinary inflammations by its gradual extension from the point first attacked, by the abundant liquid exudation into the affected part, by the tension of the skin over the affected part, by its soft boggy feeling, allowing it to be deeply indented by the finger, by the abrupt line of limitation between the diseased and healthy skin, the former descending suddenly to the healthy level instead of shading off slowly towards it, by the tendency of the inflammation to extend deeply into the subjacent tissues between and into the muscles and other structures, by the great tendency to death and sloughing of portions of skin and of the structures beneath, by the formation of pus at various different points throughout the diseased parts without any surrounding sack to protect the surrounding structures from its destructive action, and without the usual disposition of pus to advance harmlessly toward the surface and escape; and, finally, by a low prostrating type of fever, with elevated temperature of the body, coated tongue, excited breathing, and loss of appetite. The pus when escaping through a lancet wound is grayish, brownish, or reddish, with a heavy or fetid odor, and intermixed with shreds of broken-down tissues. The most destructive form, however, is that in which pus is deficient, and gangrene and sloughing more speedy and extensive.

Treatment resolves itself mainly into the elimination from the system of the poisonous products of the bacteria by laxatives and diuretics, the sustaining of the failing vitality by tonics and stimulants above all

those of the nature of antiferments, and the local application of astringent and antiseptic agents. Internal treatment may consist in 4 drams tincture of muriate of iron, and one-half dram muriate of ammonia or chlorate of potash, given in a pint of water every two hours. To this may be added, liberally, whisky or brandy when the prostration is very marked. Locally a strong solution of iron, alum, or of sulphate of iron and laudanum may be used. Or the affected part may be painted with tincture of muriate of iron or with iodized phenol. In mild cases a lotion of 4 drams sugar of lead and 2 ounces laudanum in a quart of water may be applied. It is desirable to avoid the formation of wounds and the consequent septic action, yet when pus has formed, and is felt by fluctuation under the finger to be approaching the surface, it should be freely opened with a clean, sharp lancet, and the wound thereafter disinfected daily with carbolic acid 1 part to water 10 parts, with a saturated solution of hyposulphite of soda, or with powders of iodoform or salol.

HORSE-POX, ANTHRAX, AND CUTANEOUS GLANDERS (FARCY), will come more properly under contagious diseases.

CALLOSITIES.

These are simple thickening and induration of the cuticle by reason of continued pressure, notably in lying down on a hard surface. Being devoid of hair they cause blemishes, hence smooth floors and good bedding should be secured as preventives.

HORNY SLOUGHS—SITFASTS—SLOUGHING CALLOSITIES.

These are circumscribed sloughs of limited portions of the skin, the result of pressure by badly-fitting harness, or by irritating masses of dirt, sweat, and hairs under the harness. They are most common under the saddle, but may be found under collar or breeching as well. The sitfast is a piece of dead tissue which would be thrown off but that it has formed firm connections with the fibrous skin beneath, or even deeper with the fibrous layers (fascia) of the muscles, or with the bones, and is thus bound in its place as a persistent source of irritation. The horn-like slough may thus involve the superficial part of the skin only, or the whole thickness of the skin, and even of some of the structures beneath. The first object is to remove the dead irritant by dissecting it off with a sharp knife, after which the sore may be treated with simple wet cloths or a weak carbolic acid lotion, like a common wound. If the outline of the dead mass is too indefinite, a linseed-meal poultice will make its outline more evident to the operator. If the fascia or bone has become gangrenous the dead portion must be removed with the horn-like skin. During and after treatment the horse must be kept at rest or the harness must be so adjusted that no pressure can come near the affected parts.

WARTS.

These are essentially a morbid overgrowth of the superficial papillary layer of the skin and of the investing cuticular layer. They are mostly seen in young horses, about the lips, eyelids, cheeks, ears, beneath the belly, and on the sheath, but may develop anywhere. The smaller ones may be clipped off with scissors and the raw surface cauterized with bluestone. The larger may be sliced off with a sharp knife, or if with a narrow neck they may be twisted off and then cauterized. If very vascular they may be strangled by a waxed thread or cord tied around the neck, at least three turns being made round and the ends being fixed by passing them beneath the last preceding turn of the cord, so that they can be tightened day by day as they slacken by shrinkage of the tissues. If the neck is too broad it may be transfixed several times with a double-threaded needle and then be tied in sections. Very broad warts that can not be treated in this way may be burned down to beneath the surface of the skin with a soldering bolt at a red heat and any subsequent tendency to overgrowth kept down by bluestone.

BLACK PIGMENT TUMORS—MELANOSIS.

These are common in gray and white horses on the naturally black parts of the skin at the root of the tail, around the anus, vulva, udder, sheath, eyelids and lips. They are readily recognized by their inky black color, which extends throughout the whole mass. They may appear as simple pea-like masses, or as multiple tumors aggregating many pounds, especially around the tail. In the horse these are usually simple tumors, and may be removed with the knife. In exceptional cases they prove cancerous, as they usually are in man.

EPITHELIAL CANCER—EPITHELIOMA.

This sometimes occurs on the lips at the angle of the mouth, and elsewhere in the horse. It begins as a small wart-like tumor, which grows slowly at first but finally bursts open, ulcerates and extends laterally and deeply in the skin and other tissues, destroying them as it advances (rodent ulcer.) It is made up of a fibrous framework and numerous round, ovoid, or cylindrical cavities, lined with masses of epithelial cells, which may be squeezed out as a fetid caseous material. The most successful treatment is early and thorough removal with the knife.

VEGETABLE PARASITES OF THE SKIN.

PARASITE: *Trichophyton tonsurans.* MALADY: *Tinea tonsurans—Circinate ringworm.*—This is especially common in young horses coming into training and work, in low-conditioned colts in winter and spring after confinement indoors and during moulting, in lymphatic

rather than nervous subjects, and at the same time in several animals that have herded together. The disease is common to man, and among the domestic animals to horse, ox, goat, dog, cat, and in rare instances to sheep and swine. Hence it is common to find animals of different species and their attendants suffering at once, the diseases having been propagated from one to the other.

In the horse the *symptoms* are the formation of a circular scruffy patch where the fungus has established itself, the hairs of the affected spot being erect, bristly, twisted, broken, or split up and dropping off. Later the spot first affected has become entirely bald, and a circular row of hairs around this are erect, bristly, broken, and split. These in turn are shed and a new row outside passes through the same process, so that the extension is made in a more or less circular outline. The central bald spot, covered with a grayish scruff and surrounded by a circle of broken and split hairs, is characteristic. If the scruff and diseased hairs are treated with caustic potash solution and put under the microscope the natural cells of the cuticle and hair will be seen to have become transparent, while the groups of spherical cells and branching filaments of the fungus stand out prominently in the substance of both, dark and unchanged. The eruption usually appears on the back, loins, croup, chest, and head. It tends to spontaneous recovery in a month or two, leaving for a time a dappled coat from the spots of short, light-colored hair of the new growth.

The most effective way of reaching the parasite in the hair follicles is to extract the hairs individually, but in the horse the mere shaving of the affected part is usually enough. It may then be painted with tincture of iodine twice a day for two weeks. Germs about the stable may be covered up or destroyed by a whitewash of freshly burned quicklime, the harness, brushes, etc., may be washed with caustic soda, and then smeared with a solution of corrosive sublimate one-half drachm and water 1 pint. The clothing may be boiled and dried.

PARASITE: *Trichophyton sporuloides.* MALADY: *Plica Polonica.*—*Plica Polonica,* which mats together the mane and tail of the horse as well as the hair of men, is associated with numerous spores of a trichophyton, and is rationally treated by cutting off the hair and applying tincture of iodine or a solution of corrosive sublimate (4 parts to 1,000 water).

PARASITE: *Achorion Schönleini.* MALADY: *Favus, Honeycomb ringworm.*—Megnin and Goyau, who describe this in the horse, say that it loses its characteristic honeycomb or cup-shaped appearance, and forms only a series of closely aggregated, dry, yellowish crusts the size of hemp seed on the trunk, shoulders, flanks, or thighs. They are accompanied by severe itching, especially at night. The cryptogam, formed of spherical cells with a few filaments only, grows in the hair follicles and on the cuticle, and thus a crust often forms around the root of a hair. Like the other cryptogams, their color, as seen under the

microscope, is unaffected by acetic acid, alcohol, ether, or oil of turpentine, while the cells are turned bluish by iodine. For treatment, remove the hair and apply tincture of iodine or corrosive sublimate lotion, as advised under the last paragraph.

PARASITE: *Microsporon Furfur.* MALADY: *Parasitic pityriasis.*—This attacks the horse's head where the harness presses, and leads to dropping of the hair, leaving bald patches covered with a branlike scruf, without any eruption, heat, tenderness, swelling, or rigidity of the skin. A lotion of carbolic acid, 1 dram, and water, 2½ ounces, is usually applied to effect a cure.

ANIMAL PARASITES OF THE SKIN.

Acariasis: Mange.—This affection is due to the irritation of the skin, caused by the presence of a nearly microscopic acarus or mite. The disease varies, however, according to the species of acarus which infests the skin, so that we must treat of several different kinds of acariasis.

PARASITE: *Sarcoptes equi.* MALADY: *Sarcoptic acariasis.*—This is the special *sarcoptes* of the horse, but under favorable conditions it can be transmitted to ass and mule, and even to man, and may live indefinitely on the human skin. The mite is nearly microscopical, but may be detected with a magnifying lens among moving scurf taken from the infected skin. Like all *sarcoptes*, it burrows little galleries in and beneath the scurf skin, where it hides and lays its eggs and where its young are hatched. It is therefore often difficult to find the parasite on the surface, unless the skin has been heated by a temporary exposure to the sun or in a warm room. Even then it may be needful to tie the scab on the human arm till a pricking is felt, when the acarus will be found in the center of a minute papule caused by its bite. Like other acari this is wonderfully prolific, a new generation of fifteen individuals being possible every fifteen days, so that in three months the offspring of a single pair may produce a generation of 1,500,000 young. The sarcoptes have less vitality than the nonburrowing acari, as they die in an hour when kept in dry air apart from the skin at a heat of 145° F. They live twelve to fourteen days apart from the skin in the damp air of a stable. On a piece of damp hide they lived till the twenty-fourth day, but were dead on the twenty-eighth.

The *symptoms* are an incessant, intolerable, and increasing itching of some part of the skin (head, mane, tail, back, etc.), the horse inclining himself toward the hand that scratches him, and moving his lips as if himself scratching. The hairs may be broken and rubbed off, but the part is never entirely bald as in ringworm, and there may be papules or any kind of eruption or open sores from the energy of the scratching. Scabs of any thickness may form, but the special features are the intense itching and the discovery of the acarus.

Treatment consists in the removal of the scabs by soapsuds, and, if necessary, a brush, and the thorough application of tobacco 1½ ounces and water 2 pints, prepared by boiling. This may be applied more than once, and should always be repeated after fifteen days, to destroy the new brood that may have been hatched in the interval. All harness and stable utensils should be similarly treated; blankets and rubbers may be boiled, and the stalls should be covered with a whitewash of quicklime, containing one-fourth pound of chloride of lime to the gallon.

PARASITE: *Sarcoptes mutans.* MALADY: *Sarcoptic acariasis from fowls.*—This parasite belongs to chickens, but can live on the skin of the fox and horse as well. A troublesome mange may therefore at times be traceable to the proximity of a chicken roost. The general symptoms and treatment are essentially the same as for sarcoptis equi.

PARASITE: *Psoroptis equi* (*Dermatocoptis equi, Dermatodectis equi*). MALADY: *Psoroptic acariasis.*—This produces the most frequent mange in horses, and as the parasite only bites the surface and lives among the crusts under the shelter of a hair, it is very easily discovered. It reproduces itself with equal rapidity, and causes similar symptoms to those produced by the sarcoptes. The same treatment will suffice and is more promptly effectual. The purifying of the stable must be more thorough, as the psoroptis will survive twenty to thirty days in the moist atmosphere of a stable, and may even revive after six or eight weeks when subjected to moist warmth. Infested pastures will therefore prove dangerous to horses for that length of time, and with rubbing posts, etc., should be secluded.

PARASITE: *Symbiotis equi, Dermatophagus equi, Chorioptes spathiferous.* MALADY: *Foot mange.*—This acarus attacks the heels and lower parts of the legs, especially the hind ones, and may be present for years without extending upon the body. Like the psoroptis, it lives on the surface, on the hairs, and among the scabs. It gives rise to great itching, stamping, rubbing of the one leg with the other, and the formation of papules, wounds, ulcerous sores, and scabs. The intense itching will always suggest this parasite, and the discovery of the acarus will identify the disease. Treatment is the same as for the sarcoptes, but may be confined to the legs and the parts with which they come in contact.

PARASITE.—*Dermanyssus gallinæ—Chicken Acari.* MALADY: *Poultry acariasis.*—This is a large-sized acarus, though usually miscalled "hen louse," and the disease "poultry-lousiness." The mite lives in the hen manure and adjacent woodwork, but temporarily passes on to the skin of man, and of the horse and other quadrupeds, when occasion serves. It causes much irritation, with the eruption of papules or vesicles and the formation of sores and scabs. The examination of the skin is usually fruitless, as the attacks are mostly made at night and the effects only may be seen during the day. The proximity of hen manure swarming with the acari explains the trouble, and the removal of this and a

whitewashing with quick lime with or without chloride of lime will prevent future attacks. The skin may still require bland ointments or lotions, as for congestion.

PARASITE: *Larva of a Trombidium—Leptus Americanus—Harvest Bug, misnamed Jigger (Chigoe).* MALADY: *Autumn mange.*—This parasite is a brick-red acarus, visible to the naked eye on a dark ground, and living on green vegetation in many localities. It attacks man, and the horse, ox, dog, etc., burrowing under the skin and giving rise to small papules and intolerable irritation. This continues for two or three days only if no fresh acari are received, but will last until cold weather sets in if a fresh colony is received every day. Horses at pasture suffer mainly on the lower part of the face. If kept indoors the disease will disappear, or if left at pasture a weak tar water or solution of tobacco may be applied to the face.

PARASITES: *Gamarus Pteroptoides* and *Chegletaes* live in musty fodders and are found on the horse.

TICKS.

The wood tick is familiar to inhabitants of uncultivated lands, and proves a troublesome parasite to man and beast alive. It lives on bushes, and only attaches itself to the mammal to secure a feast of blood, for when gorged it drops off to sleep off its debauch on the soil. The tick produces great irritation by boring into the skin with its armed proboscis. If pulled out the head and thorax are often left in the skin. They may be covered with oil to shut out the air from their breathing pores, or by touching them with a hot penknife they will be impelled to let go. If extracted by the hand they should be turned to the left like a screw. It is needless to particularize the several species, as all can be treated alike.

GRUBS IN SKIN.

PARASITE: *Hypoderma Silenus.* MALADY: *Larva (Grubs) under the skin.*—This fly deposits its embryo on or in the skin of the horse, as its congener (*Hypoderma bovis*) does in the ox, and the resulting larvæ pass the winter in little rounded sacks beneath the integument, furnished with a central opening, through which the mature larva escapes in early summer and develops into a fly. In districts where they exist the grubs should be pressed out of the skin and destroyed in the course of the winter.

LARVA (GRUBS) ON THE SKIN—FLY-BLOW.

The following flies, among others, deposit their eggs on open sores or on wet filthy parts of the skin, where their larvæ or grubs give rise to serious trouble: *Lucilia Cæsar* (blue bottle). *Lucilia hominivorax* (screw-worm fly), *Musca vomitoria* (meat fly), and *Sarcophaga carnaria*

(flesh-fly). To prevent their attacks wet, filthy hair should be removed and wounds kept clean, and rendered antiseptic by a lotion of carbolic acid 1 part, water 50 parts; by a mixture of 1 ounce oil of tar in 20 ounces sweet oil, or some other antiseptic. If the grubs are already present they should be picked off and one of these dressings freely applied.

FLIES.

A number of flies attack horses and suck their blood, producing great annoyance, and in some instances death. These insects not only suck the blood, but also often instil an acid poison into the skin, and in exceptional cases transfer infectious germs from animal to animal by inoculation.

Various devices are resorted to to prevent the attacks, as to sponge the skin with a decoction of walnut or elder leaves, of tobacco, to dust with Persian insect powder, to keep a light blanket or fly-net on the horse, to close doors and windows with fine screens and destroy by pyrethrum any flies that have gained admission, to remove all manure heaps that would prove breeding places for flies, to keep the stalls clean, deodorize by gypsum and to spread in them trays of dry chloride of lime. For the poisoned bites apply ammonia, or a solution of 1 part of carbolic acid in 20 parts of sweet oil or glycerine, or one-fourth ounce bicarbonate of soda and 1 dram of carbolic acid in a quart of water may be used.

STINGS OF BEES, WASPS, AND HORNETS.

These are much more irritating than the bites of flies, partly because the barbed sting is left in the wound, and partly because of the amount and quality of the venom. When a swarm attacks an animal the result may prove fatal.

Treatment consists in the application of wet clay, or of a lotion of soda or ammonia, or of carbolic acid, or of sugar of lead 2 drams, laudanum 1 ounce, and water 1 pint. The embedded stings should be extracted with fine forceps or even with the finger nails.

FLEA—PULEX.

The flea of man and those of the dog and cat, when numerous, will bite the horse and give rise to rounded swellings on the skin. To dispose of them it is needful to clear the surroundings of the grublike larvæ as well as to treat the victim. The soil may be sprinkled with quicklime, carbolic acid, coal tar, or petroleum; the stalls may be deluged with boiling water and afterward painted with oil of turpentine and littered with fresh pine sawdust, and all blankets should be boiled. The skin may be sponged with a solution of 1 part carbolic acid in 50 parts water. Dogs, cats, and pigs should be dressed with the same lotion, or, better, removed from the vicinity of the stable.

The chigoe (*Pulex penetrans*) of the Gulf coast is still more injurious, because it burrows under the surface and deposits its eggs to be hatched out slowly with much irritation. The tumor formed by it should be laid open and the parasite extracted. If it bursts so that its eggs escape into the wound, they may be destroyed by introducing a wire at a red heat.

LICE—PEDICULI.

Two kinds of lice attack the horse, one of which is furnished with narrow head and a proboscis for perforating the skin and sucking the blood, and the other—the broad-headed kind—with strong mandibles, by which it bites the skin only. Of the bloodsuckers, one is common to horse and ass and another to horse and ox, while of the nonsucking lice one species attacks horse and ox and a second ox and ass. The poor condition, itching, and loss of hair, should lead to suspicion and a close examination will detect the lice. They may be destroyed by rubbing the victim with sulphur ointment, or with sulphuret of potassium 4 ounces, water 1 gallon, or with tar water, or the skin may be sponged with benzine. The application should be repeated a week later to destroy all lice hatched from the nits in the interval. Buildings, clothes, etc., should be treated as for fleas.

TARANTULA AND SCORPION.

The bite of the first and the sting of the second are poisonous, and may be treated like other insect venom, by carbolated glycerine or a strong solution of ammonia.

SNAKE BITES.

These are marked by the double incision caused by the two fangs, by the excessive doughy (dark red) swelling around the wounds, and in bad cases by the general symptoms of giddiness, weakness, and prostration. They are best treated by enormous doses of alcohol, whisky or brandy, or by aqua ammonia very largely diluted in water, the object being to sustain life until the poison shall have spent its power. As local treatment, if the wound is in a limb, the latter may have a handkerchief or cord tied around it, above the injury, and drawn tight by a stick twisted into it. In this way absorption may be checked until the poison can be destroyed by the application of a hot iron or a piece of nitrate of silver or other caustic. A poultice of tobacco leaves is a favorite remedy, and may be used to soothe the sore after cauterization.

BURNS AND SCALDS.

For scalds the surface may be bathed with a solution of bicarbonate of soda, sweetened or not by carbolic acid, or a weak solution of sugar of lead may be used; or the surface may be dusted thickly with starch or flour and covered with cotton wool, or oil of turpentine may be ap-

plied over the scalded skin. Burns are well treated by liniment made of equal parts of lime water and linseed oil (Carron oil). For both kinds of injuries, cosmoline ten parts, and carbolic acid, one part, proves an excellent dressing. Blisters should be pricked with a needle and emptied to prevent their rupture and the exposure of the raw surface.

Severe burns, leading to destruction of very extensive patches of skin, usually render a horse useless by reason of the contraction of the resulting scar, hence the treatment of such is rarely advisable, unless followed by a skillful plastic operation. In other cases a skillful transplanting of epidermis, shaved from a healthy surface with a sharp razor, will secure the healing of a granulating wound which has proved obstinate to all other measures. In cases of burns with mineral acids (sulphuric, nitric or hydrochloric) avoid water, as that will develop heat, and cover the surface with dry whiting or chalk, and only when effervescence has ceased wash off with water. When the caustic has been a salt (copperas, bluestone, chloride of zinc, etc.) apply lime water or white of egg. If the irritant has been caustic potash, soda or ammonia, vinegar should be the first application. If sores result they may be treated like ordinary wounds.

WOUNDS OF THE SKIN.

These are divided into *incised* (*clean cut*) *wounds*, *lacerated* (*torn*) *wounds*, and *contused* (*bruised*) *and punctured wounds.*

Incised wounds are the simplest, and the sharper the instrument and the cleaner the cut the greater the hope of speedy healing. Something, however, depends on the seat and direction of the wound; thus one running from before backward on the body, or from above downward in the limb, will not tend to be drawn open and gape as would one running transversely on the body or limb. Again a wound on a joint and running across the limb will gape when the joint is bent. Again, a clean cut wound which has not been exposed to the air, and which lodges no foreign body and no septic nor infecting germ, will heal readily by simple adhesion, whereas those that have been exposed and contain matter foreign to the tissues will have healing delayed or prevented by the disturbing action of such bodies.

Healing in wounds may be said to take place by these modes:

(1) By *primary adhesion*, in which case the spherical (*embryonic*) cells, and the stellate connective tissue cells (placoids) thrown out on the surface of the wound, rapidly multiply and form a bond of union between the divided lips. Union by this means may be affected within twenty-four hours after the wound has been inflicted. Of all domestic animals, however, the horse is the least prone to such union, being more disposed to the formation of pus.

(2) By *granulation*, which is the common form of healing in raw, exposed sores, in those containing foreign bodies and septic and infecting ferments; also in torn and contused wounds. In this form the wound

becomes covered with a layer of embryonic and placoid cells, of which the superficial ones degenerate into pus cells, and thus the surface is kept moist by a layer of whitish, creamy pus. In the deeper layer of cells minute loops of capillary blood-vessels start up, cause the small rounded elevations known as granulations. In this way the deeper layer of cells receiving a blood supply is transformed into connective tissue, and from its surface new loops of blood vessels start into the layer above, and thus layer after layer of new tissue is formed, and the breach caused by the wound is gradually filled up. The new tissue as formed undergoes a steady contraction, drawing in the adjacent skin over the wound, and hence large wounds healed in this way have the skin more or less puckered around them.

(3) By *secondary adhesion*, in which two granulating lips of a wound having been brought together and kept in apposition, union takes place through the medium of the cells, as in primary adhesion.

(4) By *scabbing*, in which the exudation on the surface of the wound dries up into a firm scab, under which the process of repair goes on by the development of tissue from the deeper cells, as in adhesion.

In *treating* clean, incised wounds, attempts should be made to secure healing by primary adhesion, even in the horse. Bleeding should first be arrested, or nearly so, by applying a cold or hot sponge, or by tying bleeding vessels, and the lips of the wound should then be closed accurately, without any twisting or overlapping. In small wounds pieces of sticking plaster may be used, the lips of the wound having first been smoothly shaved, so that they may adhere firmly. In larger wounds the wound may be sewed with a curved surgical needle and a silk thread dipped in a solution of carbolic acid. The stitches may be continued from end to end of the wound and the thread prevented from slipping and loosening by a knot at each end; or the stitches may be independent, the two ends being tied together across the wound. In such cases they may be one-quarter to one-third inch apart; or the lips of the wound may be pinned together, the pins in a simple skin wound being inserted one-eighth inch from the edge, and when both lips have been transfixed in this way a thread (or hair) carried successively around the two ends of the pin and made to describe a figure 8 will hold the wound close. When the stitching is not continuous from end to end of the wound the apposition of the edges will be rendered more perfect by the application of strips of sticking plaster in the intervals.

When efforts at primary union have failed and pus has formed, or fermentative changes have occurred on the raw surfaces and the lips gape more or less, some antiseptic dressing will be required, as in the case of lacerated and contused wounds.

In cases where an incised wound has had foreign bodies or septic ferments introduced into it, these should first be removed. A current of water that has been boiled and cooled is one of the best methods of cleansing a wound, and there is no objection to the addition of one-

twentieth of its amount of carbolic acid, as this will tend to destroy any germ life that might otherwise prove fatal to the healing process. Then the wound may be stitched up as if it had been clean, and a daily dressing, of carbolic acid 1 part and sweet oil 10 parts, may be applied.

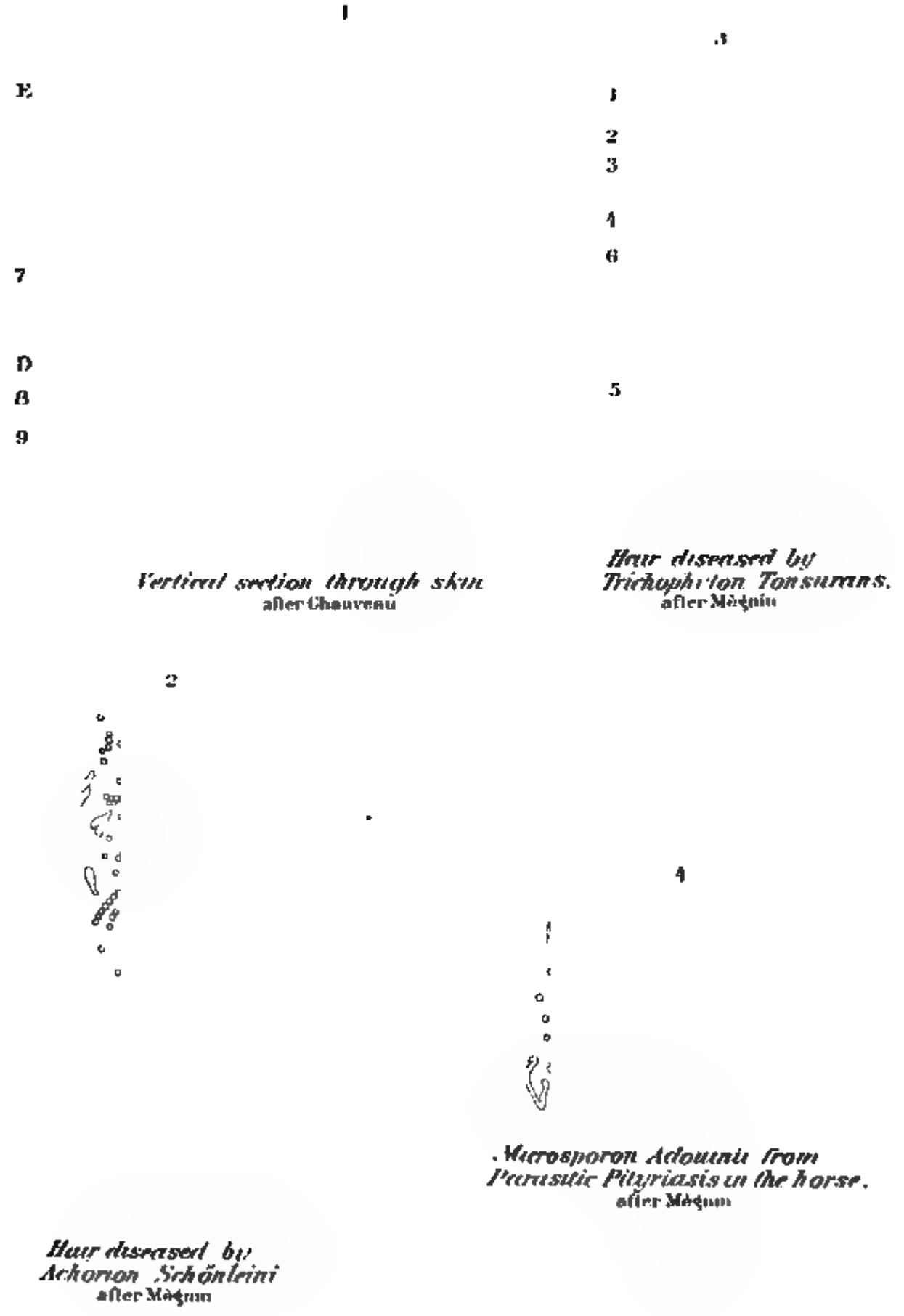
For a wound on the convex surface of a joint, where stitches are not sufficient to keep the lips accurately applied to each other, the movement of the joint may be temporarily abolished by the application of a splint and bandage, and in any such case the bandage should be applied uniformly from the hoof upward, as otherwise the limb below the bandage is liable to swell or even die.

The *treatment of contused, punctured, and lacerated wounds* demands cleansing and antiseptic applications as for an incised wound, but as primary adhesion is next to impossible, the same accurate apposition of the lips by stitching is not so essential. If portions of skin or other tissue are so detached or crushed that they can not possibly live, they may be cut off, but if there is any doubt on this matter the injured portion should be left and every attempt should be made to preserve it. Such portions of the wound as are free from such fatally injured parts may be disinfected by the carbolic lotion referred to above, and stitched up like a clean wound. The severely injured parts may be left open to discharge, and the whole may be dressed daily with the carbolized oil, or with a solution of one part of mercuric chloride in one thousand parts water.

Granulating wounds may be irrigated with the mercuric chloride solution and if the granulations become inflamed (soft, flabby, exuberant, rising above the edges of the wound) they may be touched lightly with a stick of lunar caustic so as to leave them covered with a white film.

In all wounds that fail to heal by primary union an elaborate antiseptic treatment is desirable, but the difficulty of applying this successfully to the horse in an ordinary stable would seem to forbid a lengthy description in a book of this kind.

PLATE XXXV



Vertical section through skin
after Chauveau

Hair diseased by Trichophyton Tonsurans.
after Mégnin

Hair diseased by Achorion Schönleini
after Mégnin

Microsporon Adouinii from Parasitic Pityriasis in the horse.
after Mégnin

Haines, del

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DISEASES OF THE SKIN.

WOUNDS AND THEIR TREATMENT.

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Wounds are of different kinds, and are classified as *incised*, *lacerated*, *contused*, *punctured*, and *gunshot*.

An *incised* wound, or cut, is made with some sharp body. The edges of the wound are smooth, as though cut with a knife. These wounds are the simplest we are called upon to treat. If they occur in fleshy parts, if blood-vessels, tendons, or joints are not injured, they soon recover and often without any treatment whatever. When bleeding to any considerable extent follows, and this is more likely to occur from incised than lacerated or contused wounds, we must first of all stop the flow of blood before attempting to close the wound itself or apply any other treatment. Hemorrhage may take place from either arteries or veins. If from arteries, the blood is bright red or scarlet in color, and flows in jerks or jets; if from veins, it is darker in color and the flow is regular. Bleeding from large vessels may be stopped by compress bandages, torsion, hot iron, and ligatures.

By bandages.—If the blood is from an artery, the pressure should be applied between the wound and the center of circulation, *i. e.*, towards the body; if from a vein, toward the extremities. Torsion is to be applied by the artery forceps grasping the divided vessel and twisting it the proper number of times. The *hot iron* (budding iron) may also be used to sear the end of a blood vessel and thus stop bleeding. Of all means, however, employed to stop the flow of blood from a large vessel a *ligature* is the best. The divided end of the artery or vein is to be caught up and firmly tied about one-half inch from its division. Should profuse bleeding occur from the incision of a great number of small vessels, it is best stopped by compresses moistened with the tincture of the chloride of iron or other astringents. Any moderately tight bandage of oakum, tow, cob-webs, etc., will stop the hemorrhage, often without the medicaments referred to.

When we have controlled the bleeding our next step is to cleanse the wound. This is to be accomplished by allowing warm water to flow or

trickle over the wound. Never rub an incised wound with any coarse substance. When the incision is parallel to the muscular fibers the wound does not gape to any extent. Stitches placed about an inch apart are here advisable, or we may keep the edges of the wound together by means of a bandage. If the incision be across the direction of the muscular fibers gaping ensues and a "pocket" forms at the bottom of the wound in which lodge blood and pus. In my experience stitches do more harm than good in such cases. They irritate the parts and soon cause sloughing of the skin. A bandage, so applied as to bring the edges of the wound as close together as possible, is here preferable. It should be applied from below upwards, as this encourages union from the bottom, and serves to prevent the accumulation of pus in the wound. But little is to be done after this. By means of a soft sponge apply some simple antiseptic wash, carbolic acid 1 part, glycerine 10 to 15 parts. If the parts become very much soiled they are to be gently washed with castile or carbolic soap and hot water. Should proud flesh appear it is to be treated with burnt alum, powdered bluestone, etc. Officious meddling and frequent "dressing" of such wounds do more harm than good.

Incised wounds of tendons, or of any vital part of the body, require professional attendance, and can not be separately treated of here.

Lacerated and *contused* wounds may be described together, although there is of course this difference, that in contused wounds there is no break or laceration of the skin. Lacerated wounds, however, are as a rule also contused—the surrounding tissues are bruised to a greater or lesser extent. While such wounds may not appear at first sight to be as serious as incised wounds they are commonly very much more so. Lacerations and contusions, when extensive, are always to be regarded as dangerous. Many horses die from septic infection or mortification as as a result of these injuries. We find in severe contusions an infiltration of blood into the surrounding tissues; disorganization and mortification follow, and involve often the deeper seated structures. Abscesses, single or multiple, may also result and call for special treatment.

In wounds that are lacerated the amount of hemorrhage is mostly inconsiderable; even very large blood vessels are thus torn apart without inducing a fatal result. The edges of the wound are ragged and uneven. These wounds are produced by some blunt object, as where a horse runs against fences, board piles, the corners of buildings, or where he is struck by the pole or shafts of another team, falling on rough, irregular stones, etc.

Treatment.—In lacerated wounds great care must at first be exercised in examining or probing to the very bottom of the rent or tear to see if any foreign body be present. Very often splinters of wood or bits of stone or dirt are thus lodged, and unless removed prevent the wound from healing; or if it should heal the wound soon opens again, discharging a thin, gluey matter that is characteristic of the presence of some object

in the parts. After a thorough exploration these wounds are to be carefully and patiently fomented with warm water, to which has been added carbolic acid in the proportion of 1 part to 100 of water. Rarely, if ever, are stitches to be inserted in lacerated wounds. The surrounding tissues and skin are so weakened in vitality and structure by the contusion that stitches will not hold; they only irritate the parts. It is better to endeavor to secure coadaptation by means of bandages, plasters, or collodion. One essential in the treatment of lacerated wounds is to secure a free exit for the pus. If the orifice of the wound is too high, or if pus is found to be burrowing in the tissues beneath the opening, we must then make a counter opening as low as possible. This will admit of the wound being thoroughly washed out, at first with warm water, and afterward injected with some mild astringent and antiseptic wash, as chloride of zinc, 1 dram to a pint of water. A depending opening must be maintained until the wound ceases to discharge. Repeated hot fomentations over the region of lacerated wounds afford much relief and should be persisted in.

Bruises are nothing but contused wounds, where the skin has not been ruptured. There is often considerable solution of continuity of the parts under the skin, subcutaneous hemorrhage, etc., which may result in local death—mortification—and slough of the bruised part. If the bruise or contusion is not so severe, very many cases are quickly cured by constant fomentation with hot water for from two to four hours. The water should be allowed, about this time, to *gradually* become cool and then cold. Cold fomentation must then be kept up for another hour or two. Dry the parts thoroughly and quickly, and bathe them freely with camphor 1 ounce, sweet oil 8 ounces. A dry, light bandage should then be applied, the horse allowed rest, and, if necessary, the camphorated oil may be repeated for two or three days. If, however, the wound is so severe that sloughing must ensue, we must encourage this by poultices made of linseed meal, wheat bran, turnips, onions, bread and milk, or hops. Charcoal is to be sprinkled over the surface of the poultice when the wound is bad smelling. After the slough has fallen off the wound is to be dressed with antiseptic washes of carbolic acid, chloride of zinc, permanganate of potash, etc. If granulating (filling up) too fast, use burnt alum, or air-slaked lime. Besides this local treatment we find that the constitutional symptoms of fever and inflammation call for measures to prevent or control them. This is best done by placing the injured animal on soft or green food. A physic of Barbadoes aloes, 1 ounce, should be given as soon as possible after the accident. Sedatives, as tincture of aconite root, 15 drops every two or three hours, and ounce doses of saltpeter twice or three times a day, are also to be administered. When the symptoms of fever are abated, and if the discharges from the wound are abundant, the strength of our patient must be supported by good food and tonics. One of the best tonics is as follows: Powdered sulphate of iron, pow-

dered gentian, and powdered ginger, of each 4 ounces. Mix thoroughly and give a heaping tablespoonful twice a day on the feed, or as a drench.

Punctured wounds are produced by the penetration of a sharp or blunt pointed substance, as a thorn, fork, nail, etc., and the orifice of these wounds is always small in proportion to their depth. In veterinary practice punctured wounds are much more common than the others. They involve the feet most frequently, next the legs, and often the head and face from nails protruding through the stalls and trough. They are not only the most frequent but they are also the most serious. One circumstance rendering them so is the lack of attention that they at first receive. The external wound is so small that but little or no importance is attached to it, yet in a short time swelling, pain, and acute inflammation often of a serious character, are manifested. Considering the most common of the punctured wounds we must give precedence to those of the *feet*. Horses worked in cities, about iron works, around building places, etc., are most likely to receive "nails in the feet." The animal treads upon nails, pieces of iron or screws, and forces them into the soles of the feet. If the nail, or whatever it is that has punctured the foot, is fast in some large or heavy body, and is withdrawn as the horse lifts his foot, lameness may last for only a few steps; but unless properly attended to at once he will be found in a day or two to be excruciatingly lame in the injured member. If the foreign body remains in the foot he gradually grows worse from the time of puncture until the cause is discovered and removed. If, when shoeing, a nail is driven into the "quick" (sensitive laminæ) and allowed to remain, the horse gradually evinces more pain from day to day; but if the nail has at once been removed by the smith lameness does not, as a rule, show itself for some days; or, if the nail is simply driven "too close," not actually pricking the horse, he may not show any lameness for a week or even much longer. At this point it is due the blacksmith to say that, considering how thin the walls of some feet are, the uneasiness of many horses while shoeing, the ease with which a nail is diverted from its course by striking an old piece of nail left in the wall, or from the nail itself splitting, the wonder is *not that so many horses are pricked or nails driven "too close,"* but rather that many *more* are not so injured. It is not always carelessness or ignorance on the part of the smith, by any means, that is to account for this accident. Bad and careless shoers we do meet with, but let us be honest and say that the *rarity* of these accidents points rather to the general care and attention given by these much-abused mechanics.

From the construction of the horse's foot (being encased in an impermeable horny box), and from the elasticity of the horn closing the orifice, punctured wounds of the feet are almost always productive of lameness. Inflammation results, and as there is no relief afforded by swelling and no escape for the product of inflammation, this matter

must and does burrow between the sole or wall and the sensitive parts within it until it generally opens "between hair and hoof." We can thus see why pain is so much more severe, why tetanus (lockjaw) more frequently follows wounds of the feet, and why, from the extensive, or at times *complete*, separation and "casting" of the hoof, these wounds must always be regarded with grave apprehension.

Symptoms and treatment.—A practice which, if never deviated from—that of picking up each foot, cleaning the sole, and thoroughly examining the foot each and every time the horse comes into the stable—will enable us to reduce the serious consequences of punctured wounds of the feet to the minimum. If the wound has resulted from pricking, lameness follows soon after shoeing; if from the nails being driven too close, it usually appears from four to five days or a week after receiving the shoe. We should always inquire as to the time of shoeing, examine the shoe carefully and see whether it has been partially pulled and the horse stepped back upon some of the nails or the clip. The pain from these wounds is *lancinating;* the horse is seen to raise and lower the limb or hold it from the ground altogether; often he *points* the foot, flexes the leg, and knuckles at the fetlock. Swelling of the fetlock and back tendons is also frequently seen and is apt to mislead us. *The foot must be carefully examined, and this can not be properly done without removing the shoe.* The nails should be drawn separately and carefully examined. If there is no escape of matter from the nail-holes, or if the nails themselves are not moist, we must continue our examination of the foot by carefully pinching or tapping it at all parts. With a little practice we can detect the spot where pain is the greatest or discover the delicate line or scar left at the point of entrance of the foreign body. The entire sole is then to be thinned, after which we are to carefully cut down upon the point where pain is greatest upon pressure, and, finally, *through* the sole at this spot. When the matter has escaped, the sole, so far as it was undermined by pus, is to be removed. The foot must now be poulticed for one or two days and afterward dressed with a compress of oakum saturated with carbolic-acid solution or other antiseptic dressing.

If we discover a nail or other object in the foot the principal direction, after having removed the offending body, is to cut away the sole, in a funnel shape, down to the sensitive parts beneath. *This is imperative,* and if a good free opening has been made and is maintained for a few days, hot fomentations and antiseptic dressings applied, the cure is mostly easy, simple, quick, and permanent. The horse should be shod with a leather sole under the shoe, first of all applying tar and oakum to prevent any dirt from entering the wound. In some instances nails may puncture the flexor tendons, the coffin bone, or enter the coffin joint. Such injuries are always serious, their recovery slow and tedious, and the treatment so varied and difficult that the services of a veterinarian will be necessary.

Punctured wounds of joints—Open joints.—These wounds are more or less frequent. They are always serious, and often result in anchylosis (stiffening) of the joint or death of the animal. The joints mostly punctured are the hock, fetlock, or knee, though other joints may of course suffer this injury. As the symptoms and treatment are much the same for all, I will only describe this accident as it occurs in the hock joint. Probably the most common mode of injury is from the stab of a fork, but it may result from the kick of another horse that is newly shod, or in many other ways. At first the horse evinces but slight pain or lameness. The owner discovers a small wound scarcely larger than a pea, and pays but little attention to it. In a few days, however, the pain and lameness become excessive; the horse can no longer bear any weight upon the injured leg; the joint is very much swollen and painful upon pressure; there are well-marked symptoms of constitutional disturbance—quick pulse, hurried breathing, high temperature, 103° to 106° Fahr., the appetite is lost, thirst is present, the horse reeks with sweat, and shows by an anxious countenance the pain he suffers. He may lie down, though mostly he persists in standing, and the opposite limb becomes greatly swollen from bearing the entire weight and strain for so long a time. The wound, which at first appeared so insignificant, is now constantly discharging a thin, whitish or yellowish fluid—joint-oil or water, which becomes coagulated about the mouth of the wound and adheres to the part in clots like jelly, or resembling somewhat the white of an egg. Not infrequently the joint opens at different places, discharging at first a thin bloody fluid that soon assumes the character above described.

Treatment of these wounds is most difficult and unsatisfactory. In my own experience we can do much to prevent this array of symptoms if the case is seen early, within the first twenty-four or forty-eight hours after the injury, but when inflammation of the joint is once fairly established the case becomes one of grave tendencies. Whenever a punctured wound of a joint is noticed, even though apparently of but small moment, we should without the least delay apply a strong cantharides blister over the entire joint, being even careful to fill the orifice of the wound with the blistering ointment. This treatment is almost always effectual. It operates to perform a cure in two ways—first, the swelling of the skin and tissues underneath it completely closes the wound and prevents the ingress of air; second, by the superficial inflammation established it acts to check and abate all deep-seated inflammation. In the great majority of instances, if pursued soon after the accident, this treatment performs a cure in about one week, but should the changes described as occurring later in the joint have already taken place, we must then treat by cooling lotions and the application to the wound of chloride of zinc, 10 grains to the ounce of water, or a paste made up of flour and alum. A bandage is to hold these applications in place, which is only to be removed when swelling of the leg or increas-

ing febrile symptoms demand it. In the treatment of open joints our chief aim must be to close the orifice as soon as possible. For this reason repeated probing or even injections are contra-indicated. The only probing of an open joint that is to be sanctioned is on our first visit, when we should carefully examine the wound for foreign bodies or dirt, and after removing them the probe must not again be used. The medicines used to coagulate the synovial discharge are best simply applied to the surface of the wound, on pledgets of tow, and held in place by bandages. Internal treatment is also indicated in those cases of open joints where the suffering is great. At first we should administer a light physic, and follow this up with sedatives and anodynes, as directed for contused wounds. Later, however, we should give quinine or salicylic acid in one-dram doses two or three times a day.

Wounds of tendons are similar to open joints in that there is an escape of synovial fluid, "sinew water." Where the tendons are simply punctured by a thorn, nail, or fork, we must, after a thorough exploration of the wound for any remaining foreign substance, treat with the flour and alum paste, bandages, etc., as for open joint. Should the skin and tendons be divided the case is even more serious and often incurable. There is always a large bed of granulations (proud flesh) at the seat of injury, and a thickening more or less pronounced remains. When the back tendons of the leg are severed we should apply at once a high-heel shoe (which is to be *gradually lowered* as healing advances) and bandage firmly with a compress moistened with a ten-grain chloride of zinc solution. When proud flesh appears this is best kept under control by repeated applications of a red-hot iron. Mares that are valuable as brood animals, and stock horses, should always be treated for this injury, as, even though blemished, their value is not seriously impaired. The length and time required and the expense of treatment will cause us to hesitate in attempting a cure if the subject is old and comparatively valueless.

Gunshot wounds.—These wounds are so seldom met with in our animals that an extended reference to them seems unnecessary. If a wound has been made by a bullet a careful examination should be made to ascertain if the ball has passed through or out of the body. If it has not we must then probe for the ball, and if it can be located it is to be cut out when practicable to do so. Oftentimes a ball may be so lodged that it can not be removed, and it then may become encysted and remain for years without giving rise to any inconvenience. It is often difficult to locate a bullet, as it is very readily deflected by resistances met with after entering the body. Should bones be struck by a ball they are frequently shattered and splintered to such an extent as to warrant us in having the animal destroyed. A gunshot wound, when irreparable injury has not been done, is to be treated the same as punctured wounds, *i. e.*, remove the foreign body if possible, and apply hot fomentations or poultices to the wound until suppuration is fairly established.

Antiseptic and disinfectant injections may then be used. Should pus accumulate in the tissues openings must be made at the most depending parts for its escape. Wounds from shotguns if fired close to the animal are serious. They are virtually lacerated and contused wounds. Remove all the shot possible from the wound, and treat as directed for contusions. When small shot strikes the horse from a distance it sticks in the skin or only goes through it. The shot grains must be picked out, but as a rule this "peppering" of the skin amounts to but little.

Chafing by the harness—saddle or collar galls.—Wounds or abrasions of this description are very commonly met with during the spring plowing, particularly in "new ground," or from ill-fitting saddles or collars at any time of the year. Collars too large or too small are equally productive of this trouble. In the spring of the year, when the horse has been unused to steady work for some months, the skin is tender and easily abraded. The horse, from being wintered on a scanty allowance of grain, is soft, sweats easily, and if the collar and shoulders are not properly attended to chafing of the skin is almost sure to follow. The harness should be repaired, cleaned, and oiled before using, and the collar in particular should be thoroughly cleansed after every day's use. The shoulders are to be frequently washed with cold water, and afterward bathed with white-oak bark tea, alcohol, or other astringents. Should ill-fitting or badly made harness or saddles gall a horse, they must be refitted at once, or laid aside for other and better ones.

The *treatment* of such abrasions is simple and effective if the cause be removed without delay. The parts must be thoroughly bathed in soapy water, allowing the lather to remain on the abraded surface. There are many remedies for harness galls. Among them may be mentioned alcohol, 1 pint, in which are well shaken the whites of two eggs; a solution of nitrate of silver, 10 grains to the ounce of water; sugar of lead or sulphate of zinc, 20 grains to an ounce of water; carbolic acid, 1 part in 15 parts of glycerine, and so on almost without end. Any simple astringent wash or powder will effect a cure provided the sores are not irritated by friction. If the animal must continue his work the harness must be padded or chambered.

Burns and scalds.—Wounds from burning or scalding are rare in the domestic animals, but when extensive they prove very troublesome and are often fatal. According to the severity of the burn we find the skin simply reddened, vesicles (blisters) may be produced, or the part may be literally roasted or boiled, causing complete destruction of the tissues and sloughing. When a large surface of the skin is burned or scalded the animal (if he does not die at once from shock) will soon show symptoms of fever—shivering, coldness of the extremities, weakness, restlessness, quick, feeble pulse, sighing breathing, etc.

The *treatment* in such cases must be prompt and energetic. Stimulants, such as whisky with milk and eggs, are to be frequently given.

Quinine and salicylic acid, of each 1 dram, should also be administered twice a day. The burned surface must be immediately bathed with equal parts of lime-water and linseed oil, and afterwards dredged with as much flour as can be made to adhere. If these can not be obtained cover the parts with flour paste, layers of cotton, or anything to exclude the air. Nitrate of silver, 5 grains to the ounce of water, or carbolic acid, 1 part to 50 of water, afford great relief if frequently applied. When the slough takes place we must support the animal's strength with good food and tonics, and treat the raw surface the same as other granulating wounds.

ABSCESSES.

These consist of accumulations of pus within circumscribed walls, at different parts of the body, and may be classed as *acute*, and *cold* or *chronic* abscesses.

Acute abscesses follow as the result of local inflammation in glands, muscular tissue, or even bones. They are very common in the two former. The abscesses most commonly met with in the horse (and the ones which will be here described) are those of the salivary glands, occurring during the existence of "strangles" or "colt distemper." The glands behind or under the jaw are seen to slowly increase in size, becoming firm, hard, hot, and painful. At first the swelling is uniformly hard and resisting over its entire surface, but in a little while becomes soft—fluctuating—at some portion, mostly in the center. From this time on the abscess is said to be "pointing" or "coming to a head," which is shown by a small elevated or projecting prominence, which at first is dry, but soon becomes moist with transuded serum. The hairs over this part loosen and fall off, and in a short time the abscess opens, the contents escape, and the cavity gradually fills up—heals by granulations.

Abscesses in muscular tissue are usually the result of bruises or injuries. In all cases where abscesses are forming we should hurry the ripening process by frequent hot fomentations and poultices. When they are very tardy in their development a blister over their surface is advisable. It is a common rule with surgeons to open an abscess as soon as pus can be plainly felt, but this practice can scarcely be recommended to owners of stock indiscriminately, since this little operation frequently requires an exact knowledge of anatomy. It will usually be found the better plan to encourage the full ripening of an abscess and allow it to open of itself. This is imperative if the abscess is in the region of joints, etc. When open, we must not squeeze the walls of the abscess to any extent. They may be very gently pressed with the fingers at first to remove the clots—inspissated pus—but after this the orifice is simply to be kept open by the introduction of a whalebone probe, should it be disposed to heal too soon. If the opening is at too high a level another should be made into the *lowest portion* of the ab-

scess. Hot fomentations or poultices are sometimes required for a day or two after an abscess has opened, and are particularly indicated when the base of the abscess is hard and indurated. As a rule, injections into the cavity of abscesses are not indicated, though in cases of serous abscesses (if one may be allowed such latitude of terms), as cysts of the elbow, knee, etc., astringent injections—sulphate of zinc, 15 grains to the ounce of water—are required to cause adhesions of the walls of the cavity and prevent it from refilling. If abscesses are foul and bad-smelling their cavities must be syringed with a weak solution of carbolic acid or other antiseptics.

Cold abscess is the term applied to those large, indolent swellings that are the result of a low or chronic form of inflammation, in the center of which there is a small collection of pus. These are mostly met with at the base of the neck and in front of the shoulder joint. The swelling is diffuse and of enormous extent, but slightly hotter than surrounding parts, and not very painful upon pressure. There is a pronounced stiffness, rather than pain, evinced upon moving the animal. Such abscesses have the appearance of a hard tumor, surrounded by a softer œdematous swelling, involving the tissues to the extent of a foot or more in all directions from the tumor. This diffused swelling gradually subsides and leaves the large, hardened mass somewhat well defined. One of the characteristics of cold abscesses is their tendency to remain in the same condition for a great length of time. There is neither heat nor soreness; no increase nor lessening in the size of the tumor; it remains *statu quo*. If, however, the animal should be put to work for a short time the irritation of the collar causes the surrounding tissues to again assume an œdematous condition, which, after a few days' rest, disappear, leaving the tumor as before or but slightly larger. Upon careful manipulation we may discover what appears to be a fluid deep seated in the center of the mass. The quantity of matter so contained is very small—often not more than a tablespoonful—and for this reason it can not, in all cases, be detected.

Cold abscesses are mostly, if not always, caused by the long-continued irritation of a loose and badly fitting collar. There is a slow inflammatory action going on, which results in the formation of a small quantity of matter, inclosed in very thick and but partially organized walls, that are not as well defined as is the circumference of fibrous tumors, which they most resemble.

Treatment.—The means recommended to bring the *acute* abscess "to a head" are but rarely effectual with this variety; or, if successful, too much time has been occupied in the cure. We must look for other and more rapid methods of treatment. These consist in, first of all, carefully exploring the tumor for the presence of pus. The incisions must be made over the softest part, and carried deep into the tumor (to its very bottom if necessary), and the matter allowed to escape. After this, and whether we have found matter or not, we must induce an *active*

inflammation of the tumor in order to promote solution of the thick walls of the abscess. This may be done by inserting well into the incision a piece of oakum or cotton saturated with turpentine, carbolic acid, tincture of iodine, etc., or we may pack the incision with powdered sulphate of zinc and keep the orifice plugged for twenty-four hours. These agents set up a destructive inflammation of the walls. Suppuration follows, and this should now be encouraged by hot fomentations and poultices. The orifice must be kept open, and should it be disposed to heal we must again introduce some of the agents above described. A favored treatment with many, and it is probably the best, is to plunge a red-hot iron to the bottom of the incision, and thoroughly sear all parts of the walls of the abscess. This is to be repeated after the first slough has taken place, if the walls remain thickened and indurated.

It is useless to waste time with fomentations, poultices, or blisters in the treatment of cold abscesses, since, though apparently removed by such methods, they almost invariably return again when the horse is put to work. Extirpation by the knife is not practicable, as the walls of the tumor are not sufficiently defined. If treated as above directed, and properly fitted with a good collar after healing, there will not remain any track, trace, or remembrance of the large, unsightly mass.

FISTULÆ.

The word fistula is properly applied to sinuous pipes or ducts leading from cavities to the surface of the body, through which a discharge is constantly taking place. They are lined by a false or adventitious membrane, and show no disposition to heal. Fistulæ may then exist at any part, but the name has come to be commonly accepted as applicable only to such discharges taking place from the withers, and we shall refer to this location when using the term.

Poll evil is a fistula upon the poll, and in no sense differs from fistulous withers except as to location. The description of fistula will apply then, in the main, to poll evil as well. Fistulæ are particularly liable to occur at either of these locations from the disposition of the muscles and tendinous expansions, which favor the burrowing of pus and its retention. Fistulæ follow as a result of abscesses, bruises, wounds, or long continued irritation by the harness. Among the more common causes of fistula of the poll—poll evil—are chafing by the halter or heavy bridle; blows from the butt end of the whip; the horse striking his head against the hayrack, beams of the ceiling, low doors, etc. Fistulous withers are seen mostly in those horses that have thick necks as well as those that are *very high* in the withers; or, among saddle horses, those that are *very low* on the withers, the saddle here riding forward and bruising the parts. They are often caused by bad-fitting collars or saddles, by direct injuries from blows, and from the horse rolling upon rough or sharp stones. In either of these locations, ulcers of the skin, or simple abscesses, if not properly and punctually treated

may become fistulæ. The pus burrows and finds lodgment deep down between the muscles, and only escapes when the sinus becomes surcharged or during motion of the parts, when the matter is squeezed out.

Symptoms.—These of course will vary according to the progress made by the fistula. Following an injury we may often notice soreness or stiffness of the front legs, and upon careful examination of the withers we will see small tortuous lines running from the point of irritation downward and backward over the region of the shoulder. These are superficial lymphatics, and are swollen and painful to the touch. In a day or two a swelling is noticed on one or both sides of the dorsal vertebræ, which is hot and painful and rapidly enlarging. The pain may at this time subside somewhat, the stiffness disappear, but the swelling continues and increases in size. It fluctuates upon pressure, and either opens or its contents become inspissated, dry up, leaving a tumor that gradually develops the common characteristics of a fibrous tumor. When the enlargement has opened we should carefully examine its cavity, as on its condition will wholly depend our treatment.

In the earliest stage, when there is soreness, enlarged lymphatics, but no well-marked swelling, the trouble may be frequently aborted. To do this requires both general and local treatment. A physic should be given, and the horse receive 1 ounce of powdered saltpeter three times a day in his water or feed. If the fever runs high, 20-drop doses of tincture of aconite root every two hours may be administered. Locally we will find much relief by pouring cold water from a height upon the inflamed spot for an hour at a time three or four times a day. Cooling lotions, muriate of ammonia, or saltpeter and water, sedative washes, as tincture of opium and aconite, chloroform liniment, or camphorated oil are also to be frequently applied. I have seen a number of cases presenting these initial symptoms of fistula thus aborted that required no other treatment than the avoidance of the original cause. When, however, the formation of pus is inevitable, this must be hurried as much as possible. Hot fomentations and poultices are to be constantly used, and as soon as fluctuation can be plainly felt the abscess wall is to be opened *at its lowest point.* In this procedure lies our hope of a speedy cure. If the parts are so laid open by the knife that the pus *must* escape as fast as it is formed, and where there is left no possibility of its burrowing between the muscles, forming pockets or sinuses, the parts rapidly and permanently heal without any mediation whatever, as though we had been dealing with a simple abscess of the withers, and not a true fistula at all.

Attention is again called to the directions given above as to the necessity of probing the cavity when opened. If upon a careful examination with the probe we find that there are no pockets, no sinuses, but a simple, regular abscess wall, the indication for treatment is to make an opening from below so that the matter must all escape. Rarely is any-

thing more needed than to keep the orifice open and to bathe or inject the parts with some simple antiseptic wash that is not irritant or caustic. A low opening and cleanliness constitute the essential and rational treatment. If caustics are inserted, they cause sloughing of healthy tissues and favor the formation of sinuses by producing sloughs below the point of incision. If the abscess has existed for some time and has not opened, its walls become thickened, the pus granular or inspissated, then, after an opening has been made by the knife and the contents washed and squeezed out as thoroughly as possible, the plan of treatment is materially different. There is enormous thickening of the walls, which must be destroyed and sloughed out by caustics. The best plan here is to make the first incision in *the highest* point of the swelling, introduce a piece of caustic potash (fused) 1 to 2 inches in length, carefully plug the opening with oakum or cotton, and secure the horse so that he can not disturb the parts by rubbing or biting them. The skin of the shoulder and entire leg must be thoroughly greased with lard or oil in order to prevent the caustic (should it escape) from excoriating the skin over which it flows. Twenty-four hours after the introduction of the caustic the plug is to be removed and hot fomentations applied. As soon as the discharge is again established we must make another opening with the knife or seton needle as *low* as possible, and keep this open with a seton. The object of making the first incision on top is to insure the retention of the caustic until it has attacked the entire inner surface of the cavity. If this is done the caustic causes sloughing of every portion of the diseased parts, leaving a healthy granulating surface underneath, which only requires that the depending orifice be kept open and the cavity washed out with a weak antiseptic solution once or twice a week to effect a cure. In many cases of fistula there is more than one sinus or pipe that must be explored, laid open with the knife if possible, or opened through its bottom by means of a sharp seton needle, passing a tape through the openings, and retaining it in this position for some time. If the pipes are directed straight downward between the shoulder blade and the spine it is difficult or impossible to make a counter opening, and the case becomes serious or intractable. *Caustic solutions* must now be injected carefully into the sinuses with the hope of reaching every diseased part. Probably the best is granular chloride of zinc, 1 ounce to a half pint of water. This should be injected three times during one week, after which a weak solution of the same, or sulphate of zinc, is to be occasionally injected. Pressure must be applied *from below*, and endeavors made in this manner to heal the different pipes *from the bottom*. Should the bones of the withers or the shoulder blade be diseased the complication is again serious, and these must be scraped or portions of them removed, requiring the aid of the veterinary surgeon.

In those cases of fistula where the tumor is large and hard, yet not sufficiently defined to admit of extirpation with the knife, we may often

effect a cure by making a shallow incision under the skin, over the center of the tumor, and inserting from 20 to 30 grains of arsenious acid —powdered arsenic—wrapped in a single layer of tissue paper, and retaining in the same manner as before directed for the caustic potassa. No further treatment is necesssary for some time. In about ten days to two weeks there will have taken place a large, deep slough, leaving a very ugly looking granulating wound, which, however, gradually contracts during the healing process and results in the entire disappearance of the tumor.

It is to be inferred from the foregoing that, even though fully established, fistulæ of the withers or poll are, in the majority of cases, curable. They often require much time and patient attention. The sinuses must be opened at their *inferior* extremity and kept open. At first caustic injections or applications must be thoroughly applied once or twice, after which mild astringent antiseptic washes and cleanliness complete the cure. In those cases where the sinuses or pipes are so directed that counter openings can not be made; where there are diseased conditions of the bones, articulations, etc., that can not be reached, the horse had often best be destroyed at once.

It is not at all unusual for fistulæ to break out again after having healed. This should not discourage us of a complete cure, as there is mostly only some small particle of diseased tissue remaining, caught, probably, in the healing of the orifice. A small abscess forms, points, and opens. This abscess should be injected with a solution of sulphate of zinc, 20 grains to the ounce of water, every second or third day until entirely healed.

Fistulæ of the foot—quittor—should be treated on the same principle as those already described.

When fistulous tracts are found at unusual points we must carefully examine the character and time of the discharges, and diligently probe the sinus to ascertain if the duct of some gland has not been opened, or if some foreign body, as a splinter of wood, etc., is not retained in the wound. In the first case—fistula of a gland duct—a competent veterinarian must be called. In the second instance the foreign body is to be carefully cut down upon and removed, after which healing progresses rapidly and satisfactorily.

GENERAL DISEASES.

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INFLAMMATION.

SYNONYMS: *Inflammatio*, Latin, from *Inflammare*, to flame, to burn; *Phlegmasia* θλεγμασία, Greek; *Inflammation*, French; *Inflammazione*, Italian; *Inflamacion*, Spanish; *Entzundung*, German.

Definition.—Inflammation is a process of excessive nutrition—hypernutrition—of a living tissue, by which the latter may be altered in its functions while retaining for an indefinite time a morbid life; may be destroyed, as in abscesses, ulcers, necrosis, etc.; or may be transformed into a new tissue, as in the healing of a previously injured part, the normal tissue in this case being replaced by a scar (cicatricial tissue), or by masses of calcareous deposits (lime salts).

ANIMAL TISSUES.

The non-professional reader may regard the animal tissues, which are subject to inflammation, as excessively simple structures, as similar, simple, and fixed in their organization as the joists and boards which frame a house, the bricks and iron coils of pipe which build a furnace, or the stones and mortar which make the support of a great railroad bridge. Yet while the principles of structure are thus simple, for the general understanding by the student who begins their study, the complete appreciation of the shades of variation, which differentiate one tissue from another, which define a sound tendon or ligament from a fibrous band, the result of disease filling in an old lesion and tying one organ with another, is as complicated as the nicest jointing of Chinese woodwork, the building of a furnace for the most difficult chemical analysis, or the construction of a bridge which will stand for ages and resist any force or weight.

All tissues are composed of certain fundamental and similar elements which are governed by the same rules of life, though they may appear at first glance to be widely different. These are: (*a*) amorphous substances; (*b*) fibers; (*c*) cells.

(*a*) *Amorphous substances* may be in liquid form, as in the fluid of the blood, which holds a vast amount of salts and nutritive matter in solution, or they may be in a semi-liquid condition, as the plasma which infiltrates the loose meshes of connective tissue and lubricates the surface of some membranes, or they may be in the form of a glue or cement, fastening one structure to another, as a tendon or muscle end to a bone, or again they hold similar elements firmly together as in bone, where they form a stiff matrix which becomes impregnated with lime salts. Amorphous substances again form the protoplasm or nutritive element of cells or the elements of life.

(*b*) *Fibers* are formed of elements of organic matter which have only a passive function. They can be assimilated to little strings or cords tangled one with another like a mass of waste yarn, woven regularly like a cloth or bound together like a rope. They are of two kinds, white connective tissue fibers, only slightly extensible, pliable, and very strong, and yellow elastic fibers, elastic, curly, ramified, and very dense. These fibers once created require the constant presence of fluids around them in order to retain their functional condition, as a piece of harness leather demands continual oiling to keep its strength, but they undergo no change or alteration in their form until destroyed by death.

(*c*) *Cells*, which may even be regarded as low forms of life, are masses of protoplasm or amorphous living matter with a nucleus and frequently a nucleolus or living germs, which are capable of assimilating nutriment or food, propagating themselves either into others of the same form or into fixed cells of another outward appearance and different function, but of the same constitution. It is simply in the mode of grouping of these elements that we have the variation in tissues, as: (1) loose connective tissue; (2) aponeurosis and tendons; (3) muscles; (4) cartilage; (5) bones; (6) epithelia and endothelia; (7) nerves.

(1) *Loose connective tissue* forms the great framework or scaffolding of the body, and is found under the skin, between the muscles surrounding the bones and blood vessels, and entering into the structures of almost all of the organs. In this the fibers are loosely meshed together like a sponge, leaving spaces in which the nutrient fluid and cells are irregularly distributed. This tissue we find in the skin, in the spaces between the organs of the body where fat accumulates, and as the framework of all glands.

(2) *Aponeurosis and tendons* are structures which serve for the termination of muscles and for their contention and for the attachment of bones together. In these the fibers are more frequent and dense and are arranged with regularity either crossing each other or lying parallel, and here the cells are found in minimum quantity.

(3) *Muscles.*—In these the cells lie end to end, forming long fibers which have the power of contraction, and the connective tissue is in small quantity, serving the passive purpose of a band around the contractile elements.

(4) *In cartilage* a mass of firm amorphous substance, with no vascularity and little vitality, forms the bed for the chondroplasts or cells of this tissue.

(5) *Bone* differs from the above in having the amorphous matter impregnated with lime salts, which gives it its rigidity and firmness.

(6) *Epithelia and endothelia*, or the membranes which cover the body and line all of its cavities and glands, are made up of single or stratified and multiple layers of cells bound together by a glue of amorphous substance, and resting on a layer composed of more or less fibers. When the membrane serves for secreting or excreting purposes, as in the salivary glands or the kidneys, it is usually simple when it serves the mechanical purpose of protecting a part, as over the tongue or skin it is invariably multiple and stratified, the surface wearing away while new cells replace it from beneath.

(7) *In nerves*, stellate cells are connected by their rays to each other, or to fibers which conduct the nerve impressions, or they act as receptacles and storehouses for them, just as the switch board of a telephone system serves to connect the various wires.

All of these tissues are supplied with blood in greater or less quantity. The vascularity depends upon the function which the tissue is called upon to perform. If this is great, as in the tongue, the lungs, or the sensitive part of the foot, a large amount of blood is required; if the labor is a passive one, as in cartilage, the membrane over the withers, or the tendons of the legs, the vessels only reach the periphery, and nutrition is furnished by imbibition of the fluids brought to their surface by the blood vessels.

Blood is brought to the tissues by arterioles, or the small terminations of the arteries, and is carried off from them by the veinlets or the commencement of the veins. Between these two systems are small delicate networks of vessels called capillaries, which subdivide into a veritable lace-work so as to reach the neighborhood of every element.

In health the blood passes through these capillaries with a regular current, the red cells or corpuscles floating rapidly in the fluid in the center of the channel, while the white or amœboid cells are attracted to the walls of the vessels and move very slowly. The supply of blood is regulated by the condition of repose or activity of the tissue, and under normal conditions the outflow compensates exactly the supply. The caliber of the blood vessels, and consequently the amount of blood which they carry, is governed by nerves of the sympathetic system in a healthy body with unerring regularity, but in a diseased organ the flow may cease or be greatly augmented. In health a tissue or organ receives its proper quantity of blood; the nutritive elements are extracted for the support of the tissue and for the product, which the function of the organ forms. The force required in the achievement of this is furnished by combustion of the hydro-carbons and oxygen brought by the arterial blood, then by the veins this same fluid passes off, less its oxygen,

loaded with the waste products, which are the result of the worn out and disintegrated tissues, and of those which have undergone combustion. The above brief outline indicates the process of nutrition of the tissues.

Hyper-nutrition or excessive nutrition of a tissue may be normal or morbid. If the latter the tissue becomes congested or inflamed.

CONGESTION.

Congestion is an unnatural accumulation of blood in a part. Excessive accumulation of blood may be normal, as in blushing or in the red face which temporarily follows a violent muscular effort, or, as in the stomach or liver during digestion, or in the lungs after severe work, from which, in the latter case, it is shortly relieved by a little rapid breathing. The term congestion, however, usually indicates a morbid condition, with more or less lasting effects. Congestion is *active* or *passive.* The former is produced by an increased supply of blood to the part, the latter by an obstacle preventing the escape of blood from the tissue. In either case there is an increased supply of blood, and as a result increased combustion and augmented nutrition.

Active congestion is caused by:

(1) *Functional activity.*—Any organ which is constantly or excessively used is habituated to hold an unusual quantity of blood; the vessels become dilated; if overstrained the walls become weakened, lose their elasticity, and any sudden additional amount of blood engorges the tissues so that they can not contract and congestion results. Example: The lungs of a race horse, after an unusual burst of speed or severe work, in damp weather.

(2) *Irritants.*—Heat, cold, chemical or mechanical. Any of these, by threatening the vitality of a tissue, induce immediately an augmented flow of blood to the part to furnish the means of repair—a hot iron, frostbites, acids, or a blow.

(3) *Nerve influence.*—This may produce congestion either by acting on the part reflexly, or as the result of some central nerve disturbance affecting the branch which supplies a given organ.

(4) *Plethora and sanguinary temperament.*—Full-blooded animals are much more predisposed to congestive diseases than those of a lymphatic character, or those in an anæmic condition. The circulation in them is forced to all parts with much greater force and in larger quantities. A well-bred, full-blooded horse is much more subject to congestive diseases than a common, coarse, or old worn-out animal.

(5) *Fevers.*—In fever the heart works more actively and forces the current of blood more rapidly; the tissues are weakened, and it requires but a slight local cause at any part to congest the structures already overloaded with blood. Again, in certain fevers, we find alteration of the blood itself, rendering it less or more fluid, which interferes with its free passage through the vessels and induces a local predisposition to congestion.

(6) *Warm climate and summer heat.*—Warmth of the atmosphere relaxes the tissues; it demands of the animals less blood to keep up their own body temperature, and the extra quantity accumulates in the blood-vessel system. It causes sluggishness in the performance of the organic functions, and in this way it induces congestion, especially of the internal organs. So we find founders, congestive colics, and staggers more frequent in summer than in winter.

(7) *Previous congestion.*—Whether the previous congestion of any organ has been a continuous normal one, that is, a repeated functional activity, or has been a morbid temporary overloading, it always leaves the walls of the vessels weakened and more predisposed to recurrent attacks from accidental causes than perfectly healthy tissues are. Thus a horse which has had a congestion of the lungs from a severe drive is apt to have another attack from even a lesser cause.

The alterations of congestion are distention of the blood vessels, accumulation of the cellular elements of the blood in them, and effusion of a portion of the liquid of the blood into the fibrous tissues which surround the vessels. Where the changes produced by congestion are visible, as in the eye, the nostril, the mouth, the genital organs, and on the surface of the body in white or unpigmented animals, the part appears red from the increase of blood; it becomes swollen from the effusion of liquid into the sponge-like connective tissues; it is at times more or less hot from the increased combustion; the part is frequently painful to the animal from pressure of the effusion on the nerves, and the function of the tissue is interfered with. The secretion or excretion of glands may be augmented or diminished. Muscles may be affected with spasms or may be unable to contract. The eye and ears may be affected with imaginary sights and sounds.

PASSIVE CONGESTION.

Passive congestion is caused by interference with the return of the current of blood from a part.

Old age and debility weaken the tissues and the force of the circulation, especially in the veins, and retard the movement of the blood. We then see horses of this class with stocked legs, swelling of the sheath of the penis or of the milk glands, and of the under surface of the belly. We find them also with effusions of the liquid parts of the blood into the lymph spaces of the posterior extremities and organs of the pelvic cavity.

Tumors or other mechanical obstruction, by pressing on the veins, retard the flow of blood and cause it to back up in distal parts of the body, causing passive congestion.

The alterations of passive congestion, as in active congestion, consist of an increased quantity of blood in the vessels and an exudation of its fluid into the tissues surrounding them, but in passive congestion we have a dark thick blood which has lost its oxygen, instead of the rich combustible blood rich in oxygen which is found in active congestion.

The termination of congestion is by resolution or inflammation. In the first case, the choked-up blood vessels find an outlet for the excessive amount of blood and are relieved; the transuded serum or fluid of the blood is reabsorbed, and the part returns almost to its normal condition, with, however, a tendency to weakness predisposing to future trouble of the same kind. In the other case further alterations take place, and we have inflammation.

INFLAMMATION.

Inflammation is a hypernutrition of a tissue. It is described by Dr. Agnew, the surgeon, as "a double-edged sword, cutting either way for good or for evil." The increased nutrition may be moderate and cause a growth of new tissue, a simple increase of quantity at first; or it may produce a new growth differing in quality, as a cancer; or it may be so great that, like luxuriant, overgrown weeds, the elements die from their very haste of growth, and we have immediate destruction of the part. According to the rapidity and intensity of the process of structural changes which take place in an inflamed tissue, inflammation is described as *acute* or *chronic*, with a vast number of intermediate forms. When the phenomena are marked it is termed *sthenic;* when less distinct, as the result of a broken down and feeble constitution in the animal, it is called *asthenic.* Certain inflammations are *specific*, as in strangles, the horsepox, glanders, etc., where a characteristic or specific cause or condition is added to the origin, character of phenomena, or alterations which result from an ordinary inflammation. An inflammation may be circumscribed or limited, as in the abscess on the neck caused by the pressure of a collar, in pneumonias, in glanders, in the small tumors of a splint or a jack; or it may be diffuse, as in severe fistulas of the withers, in an extensive lung fever, in the legs in a case of grease, or in the spavins which affect horses with poorly nourished bones. The causes of inflammation are practically the same as those of congestion, which is the initial step of all inflammation.

The temperament of a horse predisposes the animal to inflammation of certain organs. A full-blooded animal, whose veins show on the surface of the body, and which has a strong, bounding heart pumping large quantities of blood into the vascular organs like the lungs, the intestines, and the laminæ of the feet, is more apt to have pneumonia, congestive colics, and founder, while lymphatic, cold-blooded animals have pleurisies, inflammation of the bones, spavins, ring bones, etc., inflammation of the glands of the less vascular skin of the extremities, greasy heels, thrush, etc.

Young horses have inflammation of the membranes lining the air passages and digestive tract, while older animals are more subject to troubles in the closed serous sacks and in the bones.

The work to which a horse is put (saddle or harness, speed or draft)

will influence the predisposition of an animal to inflammatory diseases. Like in congestion, the *functional activity* of a part is an important factor in localizing this form of disease. Given a group of horses exposed to the same draft of cold air or other exciting cause of inflammation, the one which has just been eating will be attacked with an inflammation of the bowels; the one that has just been working so as to increase its respiration will have an inflammation of the throat, bronchi, or lungs; the one that has just been using its feet excessively will have a founder or inflammation of the laminæ of the feet.

The direct cause of inflammation is usually an irritant of some form. This may be mechanical or chemical, external or internal. Cuts, bruises, injuries of any kind, parasites, acids, blisters, heat, cold, secretions, as an excess of tears over the cheek or urine on the legs, all cause inflammation by direct injury to the part. Strains or wrenches of joints, ligaments, and tendons cause trouble by laceration of the tissue.

Inflammations of the internal organs are caused by irritants as above, and by sudden cooling of the surface of the animal, which drives the blood to that organ which at the moment is most actively supplied with blood. This is called *repercussion.* A horse which has been worked at speed and is breathing rapidly if suddenly chilled is liable to have pneumonia, while an animal which has just been fed if exposed to the same influence is more apt to have a congestive colic, the blood in this case being driven from the exterior to the intestines, while in the former it was driven to the lungs.

Symptoms.—The symptoms of inflammation are, as in congestion, change of *color*, due to an increased supply of blood; *swelling*, from the same cause, with the addition of an effusion into the surrounding tissues; *heat*, owing to the increased combustion in the part; *pain*, due to pressure on the nerves and *altered function.* This latter may be augmented or diminished, or first one and then the other. In addition to the local symptoms, inflammation always produces more or less constitutional disturbance or *fever.* A splint or small spavin will cause so little fever that it is not appreciable, while a severe spavin, an inflamed joint, or a pneumonia may give rise to a marked fever.

The alterations in an inflamed tissue are first those of congestion, distension of the blood vessels, and exudation of the fluid of the blood into the surrounding fibers, with, however, a more complete stagnation of the blood; fibrine or lymph, a glue-like substance, is thrown out as well, and the cells, which we have seen to be living organisms in themselves, no longer carried in the current of the blood, migrate from the vessels and finding proper nutriment proliferate or multiply with greater or less rapidity. The cells which lie dormant in the meshes of the surrounding fibers are awakened into activity by the nutritious lymph which surrounds them and they also multiply.

Whether the cell in an inflamed part is the white amœboid cell of the blood or the fixed connective tissue cell embedded in the fibers, it multi-

plies in the same way. The germ in the center (nucleus) is divided into two, and then each again into two *ad infinitum*. If the process is slow, each new cell may assimilate nourishment and become, like its ancestor, an aid in the formation of new tissues; if, however, the changing takes place rapidly the brood of young cells have not time to grow or use up the surrounding nourishment, and but half-developed they die, and we then have destruction of tissue, and pus or matter is formed, a material made up of the imperfect dead elements and the broken down tissue. Between the two there is an intermediate form, where we have imperfectly formed tissues, as in "proud flesh," cancer, large and soft splints, fungus growths, greasy heels, and thrush.

Whether the inflamed tissue is one like the skin, lungs, or intestines, very loose in their texture, or a tendon or bone, dense in structure, and comparatively poor in blood-vessels, the principle of the process is the same. The effects, however, and the appearance may be widely different. After a cut on the face or an exudation into the lungs, the loose tissues and multiple vessels allow the proliferating cells to obtain rich nourishment; absorption can take place readily, and the part regains its normal condition entirely, while a bruise at the heel or at the withers finds a dense, inextensible tissue where the multiplying elements and exuded fluids choke up all communication, and the parts die (ulcerate) from want of blood and cause a serious quittor or fistula.

This effect of structure of a part on the same process shows the importance of a perfect knowledge in the study of a local trouble, and the indispensable part which such knowledge plays in judging of the gravity of an inflammatory disease, and in formulating a prognosis or opinion of the final termination of it. It is this which allows the veterinarian, through his knowledge of the intimate structure of a part and the relations of its elements, to judge of the severity of a disease, and to prescribe different modes of treatment in two animals for troubles which appear to the less experienced observer to be absolutely identical.

Termination of inflammation.—Like congestion, inflammation may terminate by *resolution*. In this case the exuded lymph undergoes chemical alteration by oxidization, and the products are absorbed and carried off by the blood vessels and lymphatics, to be thrown out of the body by the liver, the glands of the skin, and the other excretory organs. The cells, which have wandered into the neighboring tissues from the blood vessels, find their way back again or become transformed into fixed cells. Those which are the result of the tissue cells, wakened into active life, follow the same course. The vessels themselves contract, and having resumed their normal caliber, the part apparently reassumes its normal condition; but it is always weakened, and a new inflammation is more liable to reappear in a previously inflamed part than in a sound one. The alternate termination is *mortification*. If the mortification, or death of a part, is by molecules, each losing its vitality after

the other in more or less rapid succession, it takes the name of *ulceration.* If it occurs in a considerable part at once, it is called *gangrene.* If this death of the tissues occurs deep in the organism, and the destroyed elements and proliferated and dead cells are enclosed in a cavity, the result of the process is called an *abscess.* When it occurs on a surface, it is an *ulcer*, and an abscess by breaking on the exterior becomes then also an ulcer. Proliferating and dying cells, and the fluid which exudes from an ulcerating surface, and the débris of broken down tissue, is known as *pus*, and the process by which this is formed is known as *suppuration.* A mass of dead tissue in a soft part is termed a *slough*, while the same in bone is called a *sequestrum.*

Treatment of inflammation.—The study of the cause and pathological alterations of inflammation has shown the process to be one of hypernutrition, attended by excessive blood supply, so this study will indicate the primary factor to be employed in the treatment of it. Any agent which will reduce the blood supply and prevent the excessive nutrition of the elements of the part will serve as a remedy. The means employed may be used locally to the part, or they may be constitutional remedies, which act indirectly.

Local treatment consists of:

(*a*) *Removal of the cause*, as a stone in the frog, causing a traumatic thrush; a badly fitting harness or saddle, causing ulcers of the skin; decomposing manure and urine in a stable, which, by their vapors, irritate the air tubes and lungs and cause a cough. These causes, if removed, will frequently allow the part to heal at once.

(*b*) *Rest.*—Motion stimulates the action of the blood, and thus feeds an inflamed tissue. This is alike applicable to a diseased point irritated by movement, to an inflamed pair of lungs surcharged with blood by the use demanded of them in a working animal, or to an inflamed eye exposed to light, or an inflamed stomach and intestines still further fatigued by food. Absolute quiet, a dark stable, and small quantities of easily digested food will often cure serious inflammatory troubles without further treatment.

(*c*) *Cold.*—The application of ice bags or cold water by bandages, douching with a hose, or irrigation with dripping water, contracts the blood-vessels, acts as a sedative to the nerves and lessens the vitality of a part; it consequently prevents the tissue change which inflammation produces.

(*d*) *Heat*—Either dry or moist heat acts as a derivative. It quickens the circulation and renders the chemical changes more active in the surrounding parts; it softens the tissues and attracts the current of blood from the inflamed organ; it also promotes the absorption of the effusion and hastens the elimination of the waste products in the part. Heat may be applied by hand rubbing or active friction and the application of warm coverings (bandages), or by cloths wrung out of warm water, or steaming with warm moist vapor, medicated or not, will

answer the same purpose. The latter is especially applicable to inflammatory troubles in the air passages.

(*e*) *Local bleeding.*—This treatment frequently affords immediate relief by carrying off the excessive blood and draining the effusion which has already occurred. It affords direct mechanical relief, and, by a stimulation of the part, promotes the chemical changes necessary for bringing the diseased tissues to a healthy condition. Local blood-letting can be done by scarifying, or making small punctures into the inflamed part, as in the eyelid of an inflamed eye, or into the sheath of the penis, or into the skin of the latter organ when congested, or the leg when acutely swelled. This treatment, however, is frequently very advantageous in the toe of the foot in acute founder; leeches, cups, etc., are rarely applicable in veterinary practice.

Counter irritants are used for deep inflammations. They act by bringing the blood to the surface and consequently lessening the blood pressure within. The derivation of the blood to the exterior diminishes the amount in the internal organs and is often almost miraculous in its action in relieving a congested lung or liver. The most common counter irritant is mustard flour. It is applied as a soft paste mixed with warm water to the under surface of the belly and to the sides where the skin is comparatively soft and vascular. Colds in the throat or inflammations at any point demand the treatment applied in the same manner to the belly and sides and not to the throat or on the legs, as so often used. Blisters, iodine, and many other irritants are used in the same way.

Constitutional treatment in inflammation is designed to reduce the current of blood, which is the fuel for the inflammation in the diseased part, to quiet the patient and to combat the fever or general effects of the trouble in the system. It consists of:

Reduction of blood.—This is obtained in various ways. The diminution of the quantity of blood lessens the amount of pressure on the vessels, and, as a sequel, the volume of it which is carried to the point of inflammation; it diminishes the body temperature or fever; it numbs the nervous system, which plays an important part as a conductor of irritation in diseases.

Blood-letting is the most rapid means, and frequently acts like a charm in relieving a commencing inflammatory trouble. The class of horses and cattle in which this mode of treatment is indicated usually tolerates the loss of a considerable quantity of blood without inconvenience and recuperates from the loss rapidly.

Cathartics act by drawing off a large quantity of fluid from the blood through the intestines, and have the advantage over the last remedy of removing only the watery and not the formed elements from the circulation. The blood cells remain, leaving the blood as rich as it was before. Again, the glands of the intestines are stimulated to excrete much waste matter and other deleterious material which may be acting as a poison in the blood.

Diuretics operate through the kidneys in the same way.

Diaphoretics aid depletion of the blood by pouring water in the form of sweat from the surface of the skin and stimulating the discharge of waste material out of its glands, which has the same effect on the blood pressure.

Depressants are drugs which act on the heart. They slow or weaken the action of this organ and reduce the quantity and force of the current of the blood which is carried to the point of local disease; they lessen the vitality of the animal; so they act in two ways: first, as in the previous classes, by reduction of the force of the blood; and, secondly, as in the next class, by putting to rest the animal system.

Anodynes quiet the nervous system. Pain in the horse, as in man, is one of the important factors in the production of fever, and the dulling of the former often prevents, or at least reduces, the latter. They produce sleep, so as to rest the patient and allow recuperation for the succeeding struggle of the vitality of the animal against the exhausting drain of the disease.

The diet of an animal suffering from acute inflammation is a factor of the greatestimportance. An overloaded circulation can be starved to a reduced quantity and to a less rich quality of blood, by reducing the quantity of food given to the patient. Matters of easy digestion do not tire the already fatigued organs of an animal with a torpid digestive system. Nourishment will be taken by a suffering brute in the form of slops and cooling drinks where it would be totally refused if offered in its ordinary form, as hard oats or dry hay, requiring the labor of grinding between the teeth and swallowing by the weakened muscles of the jaws and throat.

Tonics and stimulants are remedies which enter rather into the after treatment of inflammatory trouble than into the acute stages of them. They brace up weakened and torpid glands; they stimulate the secretion of the necessary fluids of the body, and hasten the excretion of the waste material produced by the inflammatory process; they regulate the action of a weakened heart; they promote healty vitality of diseased parts, and aid the chemical changes needed for returning the altered tissues to their normal condition.

FEVER.

SYNONYMS: *Febris*, Latin; *Pyrexia*, Greek; *Fièvre*, French; *Fieber*, German; *Febbre*, Italian: *Calentura*, Spanish.

The etymology of the word fever from the Latin *fevere*, to boil or to burn, and of *pyrexia*, from the Greek word πῦρ, fire, defines in a general way the meaning of the term.

Fever is a general condition of the animal body in which there is an elevation of the animal body temperature, which may be only a degree or two or may be 10° Fahrenheit. The elevation of the body temperature, which represents tissue change or combustion, is accom-

panied by an acceleration of the heart's action, a quickening of the respiration, and an aberration in the functional activity of the various organs of the body. These organs may be stimulated to the performance of excessive work, or they may be incapacitated from carrying out their allotted tasks, or in the course of a fever the two conditions may both exist, the one succeeding the other. To fever as a disease is usually added chills as an essential symptom.

Fevers are divided into essential fevers and symptomatic fevers. In symptomatic fever some local disease, usually of an inflammatory character, develops first, and the constitutional febrile phenomena are the result of the primary point of combustion, irritating the whole body, either through the nervous system or directly by means of the waste material which is carried into the circulation and through the blood vessels, and is distributed to distal parts. Essential fevers are those in which there is from the outset a general disturbance of the whole economy. This may consist of an elementary alteration in the blood, or a general change in the constitution of the tissues.

Essential fevers are subdivided into *ephemeral* fevers, which last but a short time and terminate by critical phenomena; *intermittent* fevers, in which there are alternations of exacerbations of the febrile symptoms and remissions, in which the body returns to its normal condition or sometimes to a depressed condition, in which the functions of life are but badly performed; and *continued* fevers, which include the contagious diseases, as glanders, influenza, etc., the septic diseases, as pyæmia, septicæmia, etc., and the eruptive fevers, as variola, etc.

Whether the cause of the fever has been an injury to the tissues, as a severe bruise, a broken bone, an inflamed lung, or excessive work which has surcharged the blood with the waste products of the combustion of the tissues, which were destroyed to produce force; or the pullulation of the ferments of influenza in the blood which destroy the red blood corpuscles; or the presence of irritating material, either in the form of living organisms or of their products, as in glanders or tuberculosis, the general train of symptoms are the same, only varying as the amount of the irritant differs in quantity, or when some special quality in them has a specific action on one or another tissue.

There is in fever at first a relaxation of the small blood vessels, which may have been preceded by a contraction of the same if there was a chill, and as a consequence there is an acceleration of the current of the blood. There is then an elevation of the peripheral temperature, followed by a lowering of tension in the arteries and an acceleration in the movement of the heart. These conditions may be produced by a primary irritation of the nerve centers, or the brain from the effects of heat, as is seen in *thermic* fever or sunstroke, in which trouble the extremes of symptoms may sometimes be seen alternating with a very short period, to be counted scarcely by hours.

There are times when it is difficult to distinguish between the exist-

ence of fever as a disease and a temporary feverish condition which is the result of excessive work. Like the condition of congestion of the lungs, which is normal up to a certain degree in the lungs of a race horse after a severe race, and morbid when it produces more than temporary phenomena or when it causes distinct lesions, fever, or as it is better termed a feverish condition, may follow any work or other employment of energy in which excessive tissue change has taken place, but if the consequences are ephemeral, and no recognizable lesion is apparent, it is not considered morbid. This condition, however, may predispose to severe organic disturbance and local inflammations which will cause disease, as an animal in this condition is liable to take cold, develop a lung fever or a severe enteritis, if chilled or otherwise exposed.

Fever in all animals is characterized by the same general phenomena, but we find the intensity of the symptoms modified by the species of animals affected, by the races which subdivide the species, by the families which form groups of the races, and by certain conditions in individuals themselves. For example, a pricked foot in a thoroughbred may cause intense fever, while the same injury in the foot of a Clydesdale may scarcely cause a visible general symptom. In the horse, fever produces the following symptoms:

The normal body temperature, which varies from 98° to 100° F., the latter being usually the result of some temporary cause, is elevated from 1 to 9 degrees. A temperature of 102° or 103° F. is moderate, 104° to 105° F. is high, and 106° F. and over is excessive.

This elevation of temperature can readily be felt by the hand placed in the mouth of the animal, or in the rectum, and in the folds between the hind legs; it is usually appreciable at any point over the surface of the body and in the expired air emitted from the nostrils. The ears and cannons are often as hot as the rest of the body, but are sometimes cold, which denotes a debility in the circulation. The pulse, which in a healthy horse is felt beating about 42 to 48 times in the minute, is increased to 60, 70, 90 or even 100. The respirations are increased from 14 or 16 to 24, 30, 36, or even more. With the commencement of a fever the horse usually has its appetite diminished, or it may have total loss of appetite, if the fever is excessive. There is, however, a vast difference among horses in this regard. With the same amount of elevation of temperature one horse may lose its appetite entirely, while others, usually of the more common sort, will eat at hay throughout the course of the fever and will even continue to eat oats or other grains. Thirst is usually increased, but the animal desires only a small quantity of water at a time, and in most cases of fever a bucket of water with the chill taken off should be kept standing before the patient, who may be allowed it *ad libitum*. The skin becomes dry and the hairs stand on end. Sweating is almost unknown in the early stage of fevers, but frequently occurs later in their course, when an outbreak of warm sweat is often a most favorable symptom. The mucous membranes, which are

most easily examined in the conjunctiva of the eyes and inside of the mouth, change color if the fever is an acute one; without alteration of blood the mucous membranes become of a rosy or deep red color at the outset; if the fever is attended with distinct alteration of the blood, as in influenza, and at the end of two or three days in severe cases of pneumonia or other extensive inflammatory troubles, the mucous membranes are tinged with yellow, which may even become a deep ochre in color, the result of the decomposition of the blood corpuscles and the freeing of their coloring matter, which acts as a stain. At the outset of a fever the various glands are checked in their secretions, the salivary glands fail to secrete the saliva, and we find the surface of the tongue and inside of the cheeks dry and covered with a brownish, bad-smelling deposit. The excretion from the liver and intestinal glands is diminished and produces an inactivity of the digestive organs which causes a constipation. If this is not remedied at an early period the undigested material acts as an irritant, and later we may have it followed by an inflammatory process, producing a severe diarrhea.

The excretion from the kidneys is sometimes at first entirely suppressed. It is always considerably diminished, and what urine is passed is dark in color, undergoes ammoniacal change rapidly, and deposits quantities of salts. At a later period the diminished excretion may be replaced by an excessive excretion, which aids in carrying off waste products and usually indicates an amelioration of the fever.

While the ears, cannons, and hoofs of a horse suffering from fever are usually found hot, they may frequently alternate from hot to cold in their temperature, or be much cooler than they normally are. This latter condition usually indicates great weakness on the part of the circulatory system. It is of the greatest importance as an aid in diagnosing the gravity of an attack of fever and as an indication in the selection of its mode of treatment, to recognize the exact cause of a febrile condition in the horse. In certain cases, in very nervous animals in which fever is the result of nerve influence, a simple anodyne, or even only quiet with continued care and nursing, will sometimes be sufficient to diminish it. When fever is the result of local injury the cure of the cause produces a cessation in the constitutional symptoms; when fever is the result of a pneumonia or other severe parenchymatous inflammation, it usually lasts for a definite time, and subsides with the first improvement of the local trouble, but in these cases we constantly have exaccerbations of fever due to secondary inflammatory processes, such as the formation of small abscesses, the development of secondary bronchitis, or the death of a limited amount of tissue (gangrene).

In specific cases, such as influenza, strangles, and septicæmia, there is a definite poison contained in the blood-vessel system, and carried to the heart and to the nervous system, which produces a peculiar irritation, usually lasting for a specific period, during which the temperature can be but slightly diminished by any remedy.

In cases attended with complications, the diagnosis becomes at times still more difficult, as at the end of a case of influenza which becomes complicated with pneumonia. The high temperature of the simple inflammatory disease may be grafted on that of the specific trouble, and the line of causation of the fever between the two, frequently a narrow is yet an important one, as upon it depends the mode of treatment.

Any animal suffering from fever, from any cause, is much more susceptible to attacks of local inflammation, which become complications of the original disease, than are animals in sound health. In fever we have the tissues and the walls of the blood vessels weakened, we have an increased current of more or less altered blood, flowing through the vessels and stagnating in the capillaries, which need but an exciting cause to transform the passive congestion of fever into an active congestion and acute inflammation. These conditions become still more distinct when the fever is accompanied by a decided deterioration in the flood itself, as is seen in influenza, septicæmia, and at the termination of severe pneumonias.

Fever, with its symptoms of *increased temperature, acceleration of the pulse, acceleration of respiration, dry skin, diminished secretions*, etc., must be considered as a symptom of organic disturbance.

This organic disturbance may be the result of *local inflammation* or other irritants acting through the nerves on nerve centers; *alterations of the blood*, in which a poison is carried to the nerve centers, or *direct irritants* to the nerve centers themselves, as in cases of heat stroke, injury to the brain, etc.

The treatment of fever depends upon its cause. As nerve irritation enters into the etiology of fever in all cases, one of the important factors in treatment is absolute quiet. This may be obtained by placing a sick horse in a box stall, away from other animals and extraneous noises, and sheltered from excessive light and draughts of air. Anodynes, belladonna, hyoscyamus, and opium, act as antipyretics simply by quieting the nervous system. As an irritant exists in the blood in most cases of fever, any remedy which will favor the excretion of foreign elements from it will diminish this cause. We therefore employ diaphoretics to stimulate the sweat and excretions from the skin; diuretics to favor the elimination of matter by the kidneys; cholagogues and laxatives to increase the action of the liver and intestines, and to drain from these important organs all the waste material which is aiding to choke up and congest their rich plexuses of blood vessels. As the heart becomes stimulated to increased action at the outset of a fever, and increases it by pumping an augmented quantity of blood through the whole body, we employ cardiac depressants to diminish the force of this organ. Among these antimony, aconite, veratrum viride, and iodide of potash are the most important. The increased blood pressure throughout the body may also be diminished by lessening the quantity of blood. This is obtained in many cases with advantage by direct abstraction of blood,

as in bleeding from the jugular or other veins, or by derivatives, such as mustard, turpentine, or blisters applied to the skin; or setons, which draw to the surface the fluid of the blood, thereby lessening its volume, without having the disadvantage found in bleeding, of impoverishing the elements of the blood.

When the irritation which is the cause of fever is a specific one, either in the form of a bacteria (living organism), as in glanders, tuberculosis, influenza, septicæmia, etc., or in the form of a foreign chemical element, as in rheumatism, gout, hæmaglobinuria, and other so-called diseases of nutrition, we employ remedies which have been found to have a direct specific action on them. Among the specific remedies for various diseases are counted quinine, carbolic acid, salicylic acid, antipyrine, mercury, iodine, the empyreumatic oils, tars, resins, aromatics, sulphur, and a host of other drugs, some of which are *ad hoc* and others of which are theoretical in action. Certain remedies, like simple aromatic teas, vegetable acids, as vinegar, lemon juice, etc., alkalines in the form of salts, sweet spirits of niter, etc., which are household remedies, are always useful, because they act on the excreting organs and ameliorate the *effects* of fever. Other remedies, which are to be used to influence the *cause* of fever, must be selected with judgment and from a thorough knowledge of the nature of the disease.

INFLUENZA.

SYNONYMS: *Pink-Eye*, *Typhoid Fever*, *Epizoöty*, *Epihippic Fever*, *Fièvre Typhoide*, French; *Grippe*, French; *Pferdestaube*, German; *Gastro-enteritis* of Vatel and d'Arboval; *Febris Erysipelatodes*, Zundel; *Typhus* of Delafond; Hepatic Fever, Bilious Fever, etc.

Definition.—Influenza is a contagious and infectious specific fever of the horse, ass, and mule, with alterations of the blood, stupefaction of the brain and nervous system, great depression of the vital forces and frequent inflammatory complications of the important vascular organs, especially of the lungs, intestines, brain, and laminæ of the feet. One attack usually protects the animal from future ones of the same disease, but not always. An apparent complete recovery is sometimes followed by serious sequelæ of the nervous and blood-vessel systems. The disease is very apt, under certain conditions of the atmosphere or from unknown causes, to assume an epizoötic form, with tendency to complications of especial organs, as, at one period the lungs, at another the intestines, etc.

The first description of influenza is given by Laurentius Rusius, in 1301, A. D., when it spread over a considerable portion of Italy, causing great loss amongst the war-horses of Rome and its surroundings. In 1648, A. D., an epizoötic of this disease visited Germany and spread to other ports of Europe. In 1711, A. D., under the name of "*epidemica equorum*," it followed the tracks of the great armies all over Europe, causing immense losses among the horses, while the "*rinderpest*" was

scourging the cattle of the same regions. The two diseases were confounded with each other, and were, by the scientists of the day, allied to the typhus, which was a plague to the human race at the same time. We find the first advent of this disease to the British Islands in an epizoötic among the horses of London and the southern counties of England, in 1732, which is described by Gibson. In 1758, Robert Whytt recounts the devastation of the horses of the north of Scotland from the same trouble. Throughout the eighteenth century a number of epizoötics occurred in Hanover and other portions of Germany and in France, which were renewed early in the present century, with complications of the intestinal tract, which obtained for it its name of gastro-enteritis. In 1766 it first attacked the horses in North America, but is not described as again occurring in a severe form until 1870–1872, when it spread over the entire country, from Canada south to Ohio, and then eastward to the Atlantic and westward to California. It is now a permanent disease in our large cities, selecting for the continuance of its virulence young or especially susceptible horses which pass through the large and ill-ventilated and uncleaned dealers' stables and assumes, from time to time, an enzoötic form, as from some reason its virulence increases, or as from reasons of rural economy and commerce large numbers of young and more susceptible animals are exposed to its contagion.

Etiology.—As one attack is self-protective, numbers of old horses, having had an earlier attack, are not capable of contracting it again; but, aside from this, young horses, especially those about four or five years of age, are much more predisposed to be attacked, while the older ones, even if they have not had the disease, are less liable to it. Again, the former age is that in which the horse is brought from the farm, where it has been free from the risk of contamination, and is sold to pass through the stables of the country taverns, the dirty, infected railway cars, and the foul stockyards and damp dealers' stables of our large cities. Want of training is a predisposing cause. Overfed, fat, young horses, which have just come through the sales stables, are much more susceptible to contagion than the same horses are after a few months of steady work.

Pilger, in 1805, was the first to recognize infection as the direct cause of the disease. Roll and others studied the contagiousness of influenza, and finding it so much more virulent and permanent in old stables than elsewhere classed it as a "stall miasm." The atmosphere is the most common carrier of the infection from sick animals to healthy ones, and through it it may be carried for a considerable distance. The contagion will remain in the straw bedding and droppings of the animal, and in the feed in an infected stable, for a considerable time, and if these are removed to other localities it may be carried in them. It may be carried in the clothing of those who have been in attendance on horses suffering from the disease. The drinking water in troughs and even

running water may hold the virus and be a means of its communication to other animals even at a distance. The studies of Dieckerhoff, in 1881, in regard to the contagiou of influenza were especially interesting. He found that during a local enzoötic, produced by the introduction of horses suffering from influenza into an extensive stable otherwise perfectly healthy, that the infection took place in what at first seemed to be a most irregular manner, but which was shown later to be dependent on the ventilation and currents of air through the various buildings. His experiments showed that the virus of influenza is excessively diffusible, and that it will spread rapidly to the roof of a building and pass by the apertures of ventilation to others in the neighborhood. The writer has seen cases spread through a brick wall and attack animals on the opposite side before others even in the same stable were affected. Brick walls, old woodwork, and the dirt which is too frequently left about the feed boxes of a horse stall, will all hold the contagion for some days, if not weeks, and communicate it to susceptible animals when placed in the same locality. A four-year old colt, belonging to the writer, stood at the open door of a stable where two cases of influenza had developed the day before, fully 40 feet from the stall, for about ten minutes on two successive mornings, and in six days developed the disease. On the morning when the trouble in the colt was recognized it stood in an infirmary with a dozen horses being treated for various diseases, but was immediately isolated; within one week two-thirds of the other horses had contracted the pink-eye.

Symptoms.—After the exposure of a susceptible horse to infection a *period of incubation* of from five to seven days elapses, during which the animal seems in perfect health, before any symptom is visible. When the symptoms of influenza develop they may be intense or they may be so moderate as to occasion but little alarm, but the latter condition frequently exposes the animal to use and to the danger of the exciting causes of complications which would not have happened had the animal been left quietly in its stall in place of being worked or driven out to show to prospective purchasers. The disease may run its simple course as a specific fever, with alterations only of the blood; or it may become at any period complicated by local inflammatory troubles, the gravity of which is augmented by developing in an animal with an impoverished blood and already irritated and rapid circulation and defective nutritive and reparative functions.

The first symptoms are those of a rapidly developing fever, which becomes intense within a very short period. The animal becomes dejected and inattentive to surrounding objects; stands with its head down, and not back on the halter as in serious lung diseases. It has chills of the flanks, the muscles of the croup, and the muscles of the shoulders, or of the entire body, lasting from fifteen to thirty minutes, and frequently a grinding of the teeth which warns one that a severe attack may be expected. The hairs become dry and rough and stand

on end. The body temperature increases to 104°, 104½°, and 105° F., or even in severe cases to 107° F., within the first twelve or eighteen hours. The horse becomes stupid, stands immobile with its head hanging, the ears listless, and it pays but little attention to the surrounding attendants or the crack of a whip. The stupor becomes rapidly more marked, the eyes become puffy and swollen with excessive lacrymation, so that the tears run from the internal canthus of the eye over the cheeks and may blister the skin in its course. The respiration becomes accelerated to twenty-five or thirty in a minute, and the pulse is quickened to seventy, eighty, or even one hundred, moderate in volume and in force. There is great depression of muscular force; the animal stands limp as if excessively fatigued. There is diminution, or in some cases total loss, of sensibility of the skin, so that it may be pricked or handled without attracting the attention of the animal. On movement, the horse staggers and shows a want of coördination of all of the muscles of its limbs. The senses of hearing, sight, and taste are diminished, if not entirely abolished. The visible mucous membranes (as the conjunctiva), from which it is known as the "pink-eye," and the mouth and the natural openings become of a deep saffron, ocher, or violet-red color. This latter is especially noticeable on the rim of the gums and is a condition not found in any other disease, so that it is an almost diagnostic symptom. If the animal is bled at this period the blood is found more coagulable than normal, but at a later period it becomes of a dark color and less coagulable. There is great diminution or total loss of appetite with an excessive thirst, but in many cases in cold-blooded horses the animal may retain a certain amount of appetite, eating slowly at its hay, oats, or other feed.

We have, following the fever, a tumefaction or œdema of the subcutaneous tissues at the fetlocks, of the under surface of the belly, and of the sheath of the penis, which may be excessive. This infiltration is non-inflammatory in character and produces an insensibility of the skin like the excessive stocking which we see in debilitated animals after exposure to cold. In ordinary cases the temperature has reached its maximum of 105° or 106° F. in from twenty-four to forty-eight hours from the origin of the fever. It remains stationary for a period of from three to four days without the variation between morning and evening temperature which we have in pneumonia or other serious diseases of the lungs. At the termination of the specific course of the disease, which is generally close to eighty-six hours, the fever abates almost as rapidly as it commenced, the swelling of legs and under surface of belly diminishes, the appetite returns, the strength is rapidly regained, the mucous membranes lose their yellowish color, which they attain so rapidly at the commencement of the disease, and the animal convalesces promptly to its ordinary good condition and health, and rapidly regains the large amount of weight which it lost in the early part of the disease, a loss which frequently reaches 30, 50, or even 75 pounds each

twenty-four hours. For the first three days of the high temperature there is a great tendency to constipation, which should be avoided if possible, for, if it has been marked, it may be followed by a troublesome diarrhea.

Terminations.—The termination of simple influenza may be death by extreme fever, with failure of the heart's action; from excessive coma, due generally to a rapid congestion of the brain; to the poisonous effects of the débris of the disintegrated blood corpuscles; to an asphyxia, following congestion of the lungs; or the disease terminates by subsidence of the fever, return of the appetite and nutritive functions of the organs, and rapid convalescence; or, in an unfortunately large number of cases, the course of the disease is complicated by local inflammatory troubles, whose gravity is greater in influenza than it is when they occur as sporadic diseases.

Complications.—The complications are congestions, followed by inflammatory phenomena in the various organs of the body, but they are most commonly located in the lungs, intestines, brain, or vascular laminæ of the feet. Atmospheric influence or other surrounding influences of unknown quality seem to be an important factor in the determination of the local lesions. At certain seasons of the year, and in certain epizoötics, we find 40 and 50 per cent. or even a greater percentage of the cases rendered more serious by complication of the intestines; at other seasons of the year, or in other epizoötics, we find the same per cent. of cases complicated by inflammation of the lungs, while at the same time a small percentage of them are complicated by troubles of the other organs; inflammatory changes of the brain, of the laminæ, more rarely commence in epizoötic form, but are to be found in a certain small percentage of cases in all epizoötics.

Exciting causes are important factors in complicating individual cases of influenza, or in localizing special lesions either during enzoötics or epizoötics. These exciting or determining causes act much as they would in sporadic inflammatory diseases, but in this case we find the animal much more susceptible and predisposed to be acted upon than ordinary healthy animals. With a temperature already elevated, with the heart's action driving the blood in increased quantity into the distended blood-vessels, which become dilated and lose their contractility, with a congestion of all of the vascular organs already established, it takes but little additional irritation to carry the congestion one step further and produce inflammation.

Complication of the intestines.—When any cause acts as an irritant to the intestinal tract during the course of this specific fever it may produce inflammation of the organs belonging to it. This cause may be constipation, which can only find relief in a congestion which offers to increase the function of the glands and relieve the inertia caused by a temporary cessation of activity; or irritant medicines, especially any increased use of antimony, turpentine, or the more active remedies; the

taking of indigestible food, or of food in too great quantities, or food altered in any way by fungus or other injurious alterations; the swallowing of too cold water; or any other irritant may cause congestion. This complication is ushered in by colics. The animal paws with the forefeet and evinces a great sensibility of the belly; it looks with the head from side to side, and may lie down and get up, not with violence, but with care for itself, perfectly protecting the surface of the belly from any violence. At first we find a decided constipation; the droppings if passed are small and hard, coated with a viscous varnish or even consisting of false membranes. In from 36 to 40 hours the constipation is followed by diarrhea. The alimentary discharge becomes mixed with a sero-mucous exudation, which is followed by a certain amount of suppurative matter. The animal becomes rapidly exhausted and unstable, staggers on movement, losing the little appetite which may have remained, and has exacerbations of fever. The pulse becomes softer and weaker, the respiration becomes slowly more rapid, the temperature is about 1° to 1½° F., higher. If a fatal result is not produced by the extensive diarrhea the discharge becomes arrested in from five to ten days and a rapid recovery takes place. While the diarrhea complication is a serious one, and may greatly weaken the animal, it rarely becomes so intense as to assume the name of dysentery, and it rarely becomes hemorrhagic; it is rather a diarrhea of anæmia. An enteritis takes place in an animal weakened by the previous action of the disease, and there is not sufficient vitality of the organ itself to resist the inflammation, but this is a superficial inflammation, with destruction only of the tissue of the surface of the intestines, which allows a rapid healing. Rapid recovery takes place, and the promptitude with which the intestines can commence to digest and assimilate food when the diarrhea is checked is frequently surprising.

Complication of the lungs.—If at any time during the course of the fever the animal is exposed to cold or draughts of air, or in any other way to the causes of repercussion, the lungs may be affected. In the majority of cases, however, after three, four, or five days of the fever, the congestion of the lungs commences without any exposure or apparent exciting cause. This is due to the alteration of the blood, which allows a more easy osmosis of the blood into the surrounding tissues and to the checking of the capillary blood vessels, produced by the increased rapidity and force of the circulation. Unless this congestion of the lungs is relieved at once it is followed by an inflammatory product, a fibrinous pneumonia. This pneumonia, while it is in its essence the same, differs from an ordinary pneumonia at the commencement by an insidious course. The animal commences to breath heavily, which becomes distinctly visible in the heaving of the flanks, the dilation of the nostrils, and frequently in the swaying movement of the unsteady body. The respirations increase in number, what little appetite remained is lost, the temperature increases one to two degrees, the pulse

becomes more rapid, and at times, for a short period, more tense and full, but the previous poisoning of the specific disease has so weakened the tissues that it never becomes the characteristic full, tense pulse of a simple pneumonia.

On percussion of the chest dullness is found over the inflamed areas; on auscultation at the base of the neck over the trachea a tubular murmur is heard. The crepitant râles and tubular murmurs of pneumonia are heard on the sides of the chest if the pneumonia is peripheral, but in pneumonia complicating influenza the inflamed portions are frequently disseminated in islands of variable size and are sometimes deep seated, in which case the characteristic auscultory symptoms are sometimes wanting. From this time on the symptoms of the animal are those of an ordinary grave pneumonia, rendered more severe by occurring in a debilitated animal. After resolution, however, and absorption into the lungs convalesence is rapid, and recovery takes place perhaps more quickly than it does in the simple form of the disease. There is a cough, at first hacky and aborted, later more full and moist, when we have a discharge from the nostrils which is muco-purulent, purulent, or hemorrhagic. As in simple pneumonia, in the outset this dischare may be "rusty," due to capillary hemorrhages. We find that the blood is thoroughly mixed with the matter, staining it evenly instead of being mixed with it in the form of clots. At the commencement of the complication the animal may be subject to chills, which may again occur in the course of the disease, in which case, if severe, an unfavorable termination by gangrene may be looked for. If gangrene occurs, ushered in by severe chills, a rapid elevation of temperature, a tumultuous heart, a flaky discharge from the nostrils, and a fetid breath, the symptoms are identical with those which occur in gangrene complicating other diseases.

Complication of the brain.—At any time during the course of the disease, at an early period if the fever has been intense from the outset, but more frequently after three or four days in ordinary cases, a congestion of the brain may occur. The animal, which has been stupid and immobile, becomes suddenly restless, walks forward in the stall until it fastens its head in the corner. If in a box stall and it becomes displaced from its position, it follows the wall with the nose and eyes, rubbing against it until it reaches the corner and again fastens itself. It may become more violent and rear and plunge. If disturbed by the entrance of the attendant or any loud noise or bright light, it will stamp with its fore feet and strike with its hind feet, but is not definite in fixing the object which it is resisting, which is a diagnostic point between meningitis and rabies, and which renders the animal with the former disease less dangerous to handle. If fastened by a rope to a stake or post the animal will wander in a circle at the end of the rope. It wanders almost invariably in one direction, either from the right to left or from left to right, in different cases, which is dependent upon a greater con-

gestion of one side of the brain than the other. The pupils may be dilated or contracted, or we may find one condition in one eye and the opposite in the other.

The period of excitement is followed by one of profound coma, in which the animal is immobile, the head hanging and placed against the corner of the stall, the body limp, and the motion, if demanded of the animal, unsteady. Little or no attention will be paid to the surrounding noises, the crack of a whip, or even a blow on the surface of the body. The respiration becomes slower, the pulsations are diminished, the coma lasts for variable time, to be followed by excesses of violence, after which the two alternate, but if severe the period of coma becomes longer and longer until the animal dies of spasms of the lungs or of heart failure. It may die from injuries which occur in the ungovernable attacks of violence.

Complication of the feet.—The feet are the organs which are next in frequency predisposed to congestion. This congestion takes place in the laminæ (podophyllous structures) of the feet. The stupefied animal is roused from its condition by the excessive pain produced in the feet, and assumes the position of a foundered horse; that is, if the fore feet alone are affected they are carried forward until they rest on the heels, and if the hind feet are affected all of the feet are carried forward resting on their heels, the hind ones as near the center of gravity as possible. In some cases the stupor of the animal is so great that the pain is not felt, and little or no alternation of the position of the animal is noticeable. The foot is found hot to the touch, and after a given time the depressed convex sole of the typical founder is recognized. Other complications may occur, due to the action of exciting causes, and we may have a severe corysa, laryngitis, pharyngitis or even congestion of the kidneys, followed by nephritis, congestion of the spleen or of any other organ.

Pleurisy.—This is a rare complication, but when it does occur it is ushered in by the usual symptoms of depression, rapid pulse, small respiration, elevation of the temperature, subcutaneous œdema of the legs and under surface of the belly, and we find a line of dullness on either side of the chest and an absence of respiratory murmur at the lower part. It is usually severe, and we find an effusion filling one-fourth to one-third of the thoracic cavity in from thirty-six to forty-eight hours.

The laryngo-bronchitis is not a frequent complication nor a very serious one. It is ushered in by a cough, which is rough and fatty, a purulent discharge from the nostrils and an enlargement of the surrounding lymphatic ganglia.

Pericarditis is an occasional complication of influenza, never occurring alone or in connection with other organs in the chest cavity. It is ushered in by chills, elevation of the temperature; the pulse becomes rapid, thready, and imperceptible. The heart murmurs become indis-

tinct or can not be heard. A venous pulse is seen on the line of the jugular veins along the neck. Respiration becomes more difficult and rapid. If the animal is moved the symptoms become more marked, or it may drop suddenly dead from heart failure.

Peritonitis, or inflammation of the membranes lining the belly and covering the organs contained in it, sometimes takes place. The general symptoms are similar to those of a commencing pericarditis. The local symptoms are those of pain, especially to pressure on side of the flanks and belly; distension of the latter, and sometimes the formation of flatus or gas, and constipation.

Diagnosis.—The diagnosis of influenza is based upon a continued fever, with great depression and symptoms of stupor and coma; the rapid, dark saffron, ocher, yellowish discoloration of the mucous membranes, swelling of the legs and soft tissues of the genitals. When these symptoms have lasted for a greater or less time, the diagnosis of the localization of the fever or complication is based upon the same symptoms that are produced in the more local diseases from other causes, but in influenza the local symptoms are frequently masked or even entirely hidden by the intense stupor of the animal, which renders it insensible to pain. The evidence of colic and congestion, which is followed by diarrhea, fills the symptoms for the diagnosis of enteritis. The rapid breathing or difficulty of respiration forms the suspicion at once of complication of the lungs, but as we have seen in the study of the symptoms the local evidences of lung lesions are frequently hidden. Again, we have seen that inflammation of the feet or founder complicating influenza is frequently not shown on account of the insensibility to pain on the part of the animal, which indicates the importance of running the hand daily over the hoofs to detect any sudden elevation of temperature on their surface.

The diagnosis of brain trouble is based upon the excessive violence which occurs in the course of the disease, for during the intervening period or coma there is no means of determining that it is due to this complication. Severe cases of influenza may simulate anthrax in the horse. In both we have stupor, the intense coloration of the mucous membranes of the eyes and and a certain amount of swelling of the legs and under surface of the belly. The diagnosis here can only be made by microscopic examination of the blood. In strangles, equine variola, and scalma we have an intense red, rosy coloration of the mucous membranes, full, tense pulse, and although in these diseases we may have depression, we do not have the stupor and coma, except in severe cases which have lasted for some days. In influenza we have no evidence of the formation of pus on the mucous membranes as we did in the other diseases, except in the conjunctiva of the eyes, where, however, we have had a profuse serous discharge, producing the conjunctivitis.

In severe pneumonia (lung fever) we may have profound coma, dark

yellowish coloration of the mucous membranes, and swelling of the under surface of the belly and legs, but in pneumonia we have the history of the difficulty of breathing and an acute fever of a sthenic type from the outset, and the other symptoms do not occur for several days; while in influenza we have the history of characteristic symptoms for several days before the rapid breathing and difficulty of respiration indicate the appearance of the complication. Without the history it is frequently difficult to diagnose a case of influenza of several days' standing complicated by pneumonia from a case of severe pneumonia of five to six days' standing, but from a prognostic point of view it is immaterial, as the treatment of both are identical.

Prognosis.—Influenza is an excessively serious disease for many reasons. We find the majority of horses susceptible to this virus when exposed to it. It is fatal to a large number of animals even with the best treatment, and is especially fatal to the young and to those animals which are more valuable from their fine breeding, as the disease occurs in a more serious form in well-bred animals than it does in the lymphatic and more common ones. It is more severe than the other epizoötic diseases, as its contagiousness is much greater than in the others.

The fatal issue of influenza varies in different epizoötics; where the disease is occurring only in scattered cases through a large town or country locality, and in some epizoötics, the majority of the cases run a mild form without complications; at other times, where the disease occurs in enzoötic and epizoötic form, we find over 50 per cent. of the cases complicated by disease of the lungs; in others a large number of cases are complicated by trouble of the intestines.

Alterations.—The alteration of influenza occurs in the blood, and consists of a rapid destruction of the red blood corpuscles, which are the carriers of oxygen from the lungs to all parts of the body. The animal is always found emaciated. The tissues throughout the body are found stained, and of a more or less yellowish hue, due to the disintegrated blood corpuscles which were at first the cause of the characterized discoloration of the mucous membranes in the living animal. There is always found a congested condition of all the organs, muscles, and interstitial tissues of the body. The coverings of the brain and spinal cord partake in the congested and discolored condition of the rest of the tissues.

Other alterations are dependent entirely upon the complications. If the lungs have been affected, we find effusions identical in their intimate nature with those of simple pneumonia, but they differ somewhat in their general appearance in not being so circumscribed in their area of invasion. Complication of the intestines offers the red, puffy, swelling or congested appearance which we have in an ordinary enteritis, with peeling from the surface of the membranes of the intestinal tube. The alterations of meningitis and laminitis are identical with those of sporadic cases of founder and inflammation of the brain.

Treatment.—While the appetite remains the patient should have a moderate quantity of sound hay, good oats, and bran; or even a little fresh clover, if obtainable, can be given in small quantities. With the first decided symptoms of fever the antipyretics are indicated, of which we have a variable choice. Bleeding in this disease is a questionable treatment, and is only to be employed at the very outset of the disease. In large, strong horses of a sanguinary temperament an abstraction of a few quarts of blood will frequently diminish the stupefaction, lower the temperature, slow the pulse and respiration and, render the course of the disease shorter by twelve or twenty-four hours. In some cases, however, bleeding seems to increase the amount of depression, and it should never be used after the deep ocher color of the mucous membranes show that an extensive disintegration of the blood corpuscles has taken place. Derivatives in the form of essential oils and mustard poultices, baths of alcohol, turpentine and hot water, after which the animal must be immediately dried and blanketed, serve to waken the animal up from the stupor and relieve the congestion of the internal organs. This treatment is especially indicated when complication by congestion of the lungs, intestines, or of the brain is threatened. Quinine and salicylic acid in dram doses will lower the temperature, but too continuous use of quinine in some cases increases the after depression. Aconite is especially indicated, as in addition to its action on the circulation it seems to be almost a specific in certain cases in relieving the congestion of the brain and the nervous symptoms produced by the latter. Iodide of potash reduces the excessive nutrition of the congested organs and thereby reduces the temperature; again, this drug in moderate quantities is a stimulant to the digestive tract and acts as a diuretic, causing the elimination of waste matter by the kidneys. Antimony, in guarded doses of one-half dram to 1 dram, repeated not more than two or three times, will reduce excessive fever, and can be used with special advantage at the first appearance of complications, but it must be used with care, as it is an irritant to the digestive tract and may produce intestinal complication, causing a severe diarrhea. Small does of Glauber salts and bicarbonate of soda, used from the outset, stimulate the digestive tract and prevent constipation and its evil results.

In cases of severe depression and weakness of the heart, digitalis can be used with advantage. At the end of the fever, and when convalescence is established, alcohol in one-half pint doses and good ale in pint doses may be given as stimulants; to these may be added dram doses of turpentine.

In complication of the intestines camphor and asafetida are most frequently used to relieve the pain causing the colics; diarrhea is also relieved by the use of bicarbonate of soda, nitrate of potash, and drinks made from boiled rice or starch, to which may be added small doses of laudanum.

In complication of the lungs iodide of potash and digitalis are most

frequently indicated, in addition to the remedies used for the disease itself.

Founder occurring as a complication of fever is difficult to treat. It is, unfortunately, frequently not recognized until inflammatory changes have gone on for some days. If recognized at once, local bleeding and the use of hot or cold water, as the condition of the animal will permit, are most useful, but in the majority of cases the stupefied animal is unable to be moved satisfactorily or to have one foot lifted for local treatment, and the only treatment consists in local bleeding above the coronary bands and the application of poultices.

For congestion of the brain large doses of aconite and small repeated doses of mercury form the ordinary mode of treatment. During convalescence small doses of alkalines may be kept up for some little time, but the greatest care must be used, while furnishing the animal with plenty of nutritious, easily digested food, not to overload the intestinal tract, causing constipation and consecutive diarrhea. Special care must be taken for some weeks not to expose the animal to cold.

SEQUELÆ OF INFLUENZA.

Anasarca.—A previous attack of influenza is the most common predisposing cause of a serious disease of the nervous system; paralysis of the vaso-motor nerves which govern the circulation in the smaller blood vessels and capillaries. This trouble, which is also known as purpura hemorrhagia and as scarlatina, appears most frequently a few weeks after convalescence is established. It occurs more frequently in those animals which have made a rapid convalescence and are apparently perfectly well, and in those which have evidently perfectly regained their health, than it does in those which have made a slower recovery. The exciting cause of this trouble is usually exposure to cold; and again, exposure to cold draughts of air on the heated but not necessarily sweating animal is more apt to cause the trouble than exposure to rain or wet. This latter will more frequently cause complication of the internal organs, such as pneumonia, pleurisy, etc.

Anasarca commences by symptoms which are excessively variable. The local lesions may be confined to a small portion of the animal's body and the constitutional phenomena be nul. The appearance and gravity of the local lesions may be so unlike, from difference of location, that they seem to belong to a separate disease, and complications may completely mask the original trouble.

In the simplest form the first symptom noticed is a swelling, or several swellings occurring on the surface of the body, on the forearm, the leg, the under surface of the belly, or on the side of the head. The tumefaction is at first the size of a hen's egg; not hot, little sensitive, and distinctly circumscribed by a marked line from the surrounding healthy tissue. These tumors gradually extend until they coalesce, and in a few hours we have swelling up of the legs, legs and belly, or the head,

to an enormous size; they have always the characteristic constricted border, which looks as if it had been tied with a cord. In the nostrils are found small reddish spots or petechiæ, which gradually assume a brownish and frequently a black color. Examination of the mouth will frequently reveal similar lesions on the surface of the tongue, along the lingual gutter and on the frænum. If the external swelling has been on the head the petechiæ of the mucous membranes are apt to be more numerous and to coalesce into patches of larger size than when the dropsy is confined to the legs. The animals may be rendered stiff by the swelling of the legs, or be annoyed by the awkward swollen head, which at times may be so enormous as to resemble that of a hippopotamus rather than that of a horse. During this period the temperature remains normal, the pulse, if altered at all, is only a little weaker, the respiration is only hurried if the swelling of the head infringes on the caliber of the nostrils. The appetite remains normal. The animal is attentive to all that is going on, and, except for the swelling, apparently in perfect health.

In from two to four days the tissues can no longer resist the pressure of the exuded fluid. Over the surface of the skin which covers the dropsy we find a slight serous sweating, which loosens the epidermis and dries so as to simulate the eruption of some cutaneous disease. If this is excessive we may see irritated spots which are suppurating. In the nasal fossæ the hemorrhagic spots have acted as irritants, and, inviting an increased amount of blood to the Schneiderian membrane, produce a coryza or even a catarrh. We may now find some enlargement and peripheral œdema of the lymphatic glands, which are fed from the affected part. The thermometer indicates a slight rise in the body temperature, while the pulse and respiration are somewhat accelerated. The appetite usually remains good. In the course of a few days the temperature may have reached 102°, 103°, or 104° F.

Fever is established, not an essential or specific fever in any way, but a simple secondary fever produced by the dead material from the surface or superficial suppuration, and by the oxidization and absorption of the colloid mass contained in the tissues. Just such a fever as would be produced by an excoriation of a considerable surface of the skin in an animal, otherwise sound, or by the absorption of the œdema resulting from a blow.

Suppuration may become excessive from the great distension and loss of vitality of the skin. Here the lesion is visible and the constitutional phenomena are marked.

Lymphangitis may be established from the large amount of irritating material which the ducts and glands of the lymphatic system are forced to carry from the affected part.

Gangrene may be developed in spots from the size of a pea to that of a hen's egg. The great distension of the subcutaneous layer of connective tissue or the excessive hemorrhage in the submucous layer may

completely destroy the vitality of the part, and brown and then black masses of slough appear, to be eliminated and leave a deep rosy ulcer in their place: This is more commou in the nose and under the tongue.

Excessive swelling of the head.—The swelling of the head may increase and extend outside to the throat or to the nostrils until the latter are closed, or to the larynx, which is so pressed upon as to render respiration difficult or impossible. The same complication renders mastication and deglutition equally difficult.

Metastasis.—This is a frequently dreaded complication. If the trouble has originally been in the legs and belly it may suddenly commence to appear in the head, and disappear from the part first affected, or the opposite more favorable change sometimes occurs, the dangerous swelling of the head disappearing to attack the belly or legs.

Enteric œdema.—The effusion on the exterior may take another course and pass to the intestine, causing symptoms of colic, which either ends fatally or more rarely terminates by a profuse diarrhœa, which is sometimes hemorrhagic in character.

Pulmonary œdema.—Marked dyspnœa, without swelling of the head, is indicative of metastasis into the parenchyma of the lungs, which will rapidly show dullness on percussion and tubular murmurs on auscultation. The tumefaction leaves the exterior and attacks the lungs, and the animal dies of asphyxia.

Septicæmia.—There is certainly no disease in veterinary practice which offers a more favorable field for the development of septicæmia. The large mass of colloid matter held at the temperature of the animal body could not be surpassed in the gelatine tube of bacteriological laboratory as a nutriment for the putrefactive ferments. Septicæmia is ushered in by general rigor, sudden elevation of temperature, and marked symptoms of coma.

TERMINATIONS.

Resolution.—The simple form of the disease most frequently terminates favorably on the eighth or tenth day by absorption of the effusion, with usually a profuse diuresis, and with or without diarrhea. The appetite remains good or is at times capricious. The surface of the body is dirty from desquamated epithelium, and at times there is a complete loss of hair, giving the appearance of a bad case of sarcoptic mange. At other times the absorption is slow, lasting for some weeks with tendency to relapses. Again there may be left some permanent induration, the result of embryonic growth.

Death.—Death may occur from mechanical asphyxia, produced by closure of the nostrils or closure of the glottis. Metastasis to the lungs is almost invariably fatal, causing death by asphyxia. Metastatis to the intestines may cause death from pain, enteritis, or hemorrhage.

Excessive suppuration, *lymphangitis*, and *gangrene* are causes of a fatal termination by exhaustion. Mortal exhaustion is again produced by inability to swallow in cases of excessive swelling of the head.

Peritonitis may arise secondary to the enteric œdema, or by perforation of the stomach or intestines by a gangrenous spot.

Septicæmia terminates fatally with its usual train of symptoms.

The essential alterations of anasarca are exceedingly simple; the capillaries are dilated, the lymphatic spaces between the fibers of the connective tissue are filled with serum, and the coagulable portion of the blood presents a yellowish or citrine mass, jelly-like in consistency, which has stretched out the tissue like the meshes of a sponge. Where the effusion has occurred between the muscles, as in the head, these are found dissected and separated from each other like those of a hog's head by the masses of fat. The surface of the skin is desquamated and frequently denuded of the hair. Frequently there are traces of suppuration and of ulceration. The mucous membrane of the nose is found studded with small, hemorrhagic spots, sometimes red, more frequently brown or black, often coalesced with each other in irregular sized patches and surrounded by a reddish zone, the product of irritation. If œdema of the intestines has occurred the membrane is found four or five times its normal thickness, reddish in color with hemorrhages on the free surface. Œdema of the lungs leaves these organs distended. On section a yellowish fluid runs out, like the fluid does from lungs which have been filled with water in the dissecting room. The secondary alterations vary according to the complications. There are frequently the lesions of asphyxia; externally we find ulcers, abscesses, and gangrenous spots and the deep ulcers resulting from the latter. The lymphatic cords and glands are found, with all the lesions of lymphangitis. Again are found the traces of excessive emaciation, or the lesions of septicæmia. Except from the complications the blood is not altered in anasarca. If previous to the attack the animal had ænemia the tissues will be infiltrated and the pallor and other appearances of ænemia will be found. If prior to the attack the animal is in moderate health, with unaltered blood, the blood will be found to clot with the typical change of the buffy coat of the horse. In death by asphyxia the blood will be found fluid, black in color, but gradually turns red, and clots on exposure to the air. Dickerhoff mentions fibrinous pneumonia among the alterations. I myself have never seen it occur.

The diagnosis of anasarca must principally be made from farcy or glanders. In anasarca the swelling is nonsensitive, while sensitive in the acute swelling of farcy. The nodes of farcy are distinct and hard and never circumscribed, as in the other disease. The eruption of glanders on the mucuous membranes is nodular, hard, and pellet-like. The redness disappears on pressure. In case of excessive swelling of the head, in anasarca, there may occur an extensive sero-fibrinous exudation from the mucous membranes of the nose, poured out as a semi-fluid mass or as a cast of the nasal fossæ, never having the appearance or typical oily character, which it has in glanders. The inflammation of the lymphatic cords and glands in anasarca does not produce the hard, indurated character which is found in farcy.

Septicæmia may have occurred primarily, or as a complication of anasarca. The diagnosis must be from the history, and the prognosis is of little import.

While this is not an excessively fatal disease the prognosis must always be guarded. The majority of cases run a simple course and terminate favorably at the end of eight or ten days, or possibly after one to two relapses, requiring several weeks for complete recovery. Effusion into the head renders the prognosis much more grave from the possible danger of mechanical asphyxia. Threatened mechanical asphyxia is especially dangerous on account of the risk of blood-poisoning after an operation of tracheotomy.

Metastasis to the viscera, or from the legs to the head, is a most serious complication, while metastasis from the head or other portions to the belly and legs is favorable, as removing, for a moment at least, all danger of immediate death. The prognosis is otherwise based on the complications, their extent and their individual gravity, existing, as they do here, in an already debilitated subject.

Treatment.—The treatment of anasarca may have been as variable as are the lesions. The indications are at once shown by the alterations and mechanism of the disease, which we have just studied. These are:

(1) Regulation of the disordered circulation of the blood and strengthening of the vaso-motor system.

(2) Promotion of absorption of the colloid mass, which has infiltrated the tissues. This, of course, is based upon oxidization in order to metamorphose the exudation into absorbable crystalloids.

(3) Prevention of metastasis, which is the most frequent fatal termination of this trouble, if not directly by œdema of the lung or enteritis, indirectly by further weakening the already debilitated system.

(4) The immediate treatment of the complications, each, *per se*, asphyxia and gangrene, being the two which most frequently call for active interference.

These indications call for constitutional and local remedies.

Blood-letting would at first seem totally contra-indicated, but in certain cases it acts like a charm. Debilitated, as an animal usually is when attacked by anasarca, we have yet seen that one of the great predisposing causes is the plethoric habit. The current of blood, like a swollen river after a spring storm, can be thrown from its usual course by the slightest side channel. The use of bleeding requires the acute perception of the practitioner to be put upon the alert to regulate it. Not only the present condition, but the previous state of health, and the probable future hygienic and medical care must be taken into consideration. Given a case that will admit of bleeding, the quantity to be taken is always a minimum one, and it is to be regulated by the effect upon the pulse during the bleeding.

With the weakened walls of the vessels but a little lessening of the pressure will produce a vacuum, when compared with the condition

found in an ordinary blood-vessel system, with normal elastic walls. Bleeding is only permissible at the outset of the disease when the tumors are still isolated. When the tumefaction has coalesced all the blood is required to oxidize the mass of effused colloid matter.

Hygiene now comes into play as the most important factor. Oats, oat and hay tea, milk, eggs, anything which the stomach or rectum can be coaxed to take care of, must be employed to give the nutriment which is the only thing that will permanently strengthen the tissues, and they must be strengthened in order to keep the capillaries at their proper caliber.

Laxatives, diaphoretics, and diuretics must be used to stimulate the emunctories so that they shall carry off the large amount of the products of decomposition, which result from the stagnated effusions of anasarca. Of these the sulphate of soda in small repeated doses, and the nitrate of potash and bicarbonate of soda in small quantity, and the chlorate of potash in single large doses, will be found useful. Williams cites the chlorate of potash as an antiputrid; it is useful, I believe, because it frees oxygen, and oxygen is a chemical purifier.

Stimulants and astringents are directly indicated. The animal wants wakening up, everything in it wants a shock, and a belt to hold it in place. Spirits of turpentine serves the double purpose of a cardiac stimulant and a powerful warm diuretic, for the kidneys in this disease will stand a wonderful amount of work. Camphor can be used with advantage. Coffee and tea are two of the diffusible stimulants which are too much neglected in veterinary medicine; both are valuable adjuncts in treatment in anasarca, as they are during convalescence at the end of any grave disease which has tended to render the patient anæmic. Dilute sulphuric acid and hydrochloric acid are perhaps the best examples of a combination of stimulant, astringent, and tonic which can be employed. The simple astringents of mineral origin, sulphates of iron, copper, etc., are useful as digestive tonics; I doubt if they have any constitutional effect. The vegetable astringents, tannic acid, etc., have not proved efficacious in my hands. Iodide of potash in small doses serves the triple purpose of digestive tonic, denutritive for inflammation, and diuretic.

Externally.—Sponging the swollen parts, especially the head, when the swelling occurs here, is most useful. The bath should be at an extreme of temperature—either ice-cold to constrict the tissues, or hot water to act as an emollient and to favor circulation. Vinegar may be added as an astringent. When we have excessively denuded surfaces, suppuration, or open wounds, disinfectants should be added to the wash.

In cases of excessive swelling, especially of the head, mechanical relief may be required. Punctures of the part should be made with the hot iron even in country practice, as no other disease so predisposes to septic contamination. When mechanical asphyxia is threatened tra-

cheotomy may be demanded. Here, again, the hot iron should be used, and disinfectant applications should be constantly applied. With the first evidence of dyspnœa, not due to closing of the nostrils or glottis, or with the first pawing which gives rise to a suspicion of colic, a mustard plaster should be applied over the whole belly and chest. The sinapism will draw the current of the circulation to the exterior, the metastasis to the lungs or intestines is prevented, and the enfeebled, nervous system is stimulated to renewed vigor by the peripheral irritation. The organs are encouraged by it to renewed functional activity; the local inflammation produced by it favors absorption of the exudation. The objection to the use of blisters is their more severe action and the danger of mortification. Septicæmia, when occurring as a complication, requires the ordinary treatment for the putrid diseases, with little hope of a good result.

After recovery the animal regains its ordinary health, and in my own experience there has been no predisposition to a return of the disease.

STRANGLES.

SYNONYMS: Distemper, colt-ill, catarrhal fever, one form of shipping fever, *Febris pyogenica.*

Definition.—Strangles is an infectious disease of the horse, mule, and ass; seen most frequently in young animals, and usually leaving an animal which has had one attack protected from future trouble of the same kind. It appears as a fever, lasting for a few days, with formation of matter or pus in the air tubes and lungs, and frequently the formation of abscesses in various parts of the body, both near the surface and in the internal organs. It usually leaves the animal after convalescence perfectly healthy and as good as it was before, but sometimes leaves it a roarer, or is followed by the development of deep-seated abscesses which may prove fatal.

Causes.—The cause of strangles is infection by direct contact with an animal suffering from the disease, or indirectly through contact with the discharges from an infected animal, or by means of the atmosphere in which an infected animal has been. There are many predisposing causes which render some animals much more subject to contract the disease than others. Early age, which has given it the popular name of colt-ill, offers many more subjects than the later periods of life do, for the animal can contract the disease but once, and the large majority of adult and old animals have derived an immunity from previous attacks. At three, four, or five years of age the colt, which has been at home, safe on a meadow or in a cozy barnyard, far from all intercourse with other animals or sources of contagion, is first put to work and driven to the market town or county fairs to be exposed to an atmosphere or to stables contaminated by other horses suffering from disease and serving as infecting agents. If it fails to contract it there, it is sold and shipped in foul, undisinfected railway cars, to dealers' stables

equally unclean, where it meets many opportunities of infection. If it escapes so far, it reaches the time for heavier work and daily contact on the streets of towns or large cities, with numerous other horses and mules, some of which are sure to be the bearers of the germs of this or some other infectious disease, and at last it succumbs.

The period of the eruption of the last permanent teeth, or the end of the period of development from the colt to an adult horse, at which time the animals usually have a tendency to fatten and be excessively full-blooded, also seems to be a predisposing period for the contraction of this as well as of the other infectious diseases. Thoroughbred colts are very susceptible, and frequently contract strangles at a somewhat earlier age than those of more humble origin. Mules and asses are much less susceptible and are but rarely affected. Other animals are not subject to this disease, but there is a certain analogy between it and distemper in dogs. After exposure to infection there is a period of incubation of the disease, lasting from two to four days, during which the animal enjoys its ordinary health.

Symptoms.—The horse at first is a little sluggish if used, or when placed in its stable, is somewhat dejected, paying but moderate attention to the various disturbing surroundings. Its appetite is somewhat diminished in many cases, while in some cases the animal eats well throughout. Thirst is increased, but not a great deal of water is taken at one time. If a bucket of water is placed in the manger, before the patient, it will dip its nose into it and swallow a few mouthfuls, allowing some of it to drip back, and then stop, to return to it in a short time. The coat becomes dry and the hairs stand on end. At times the horse will have chills of one or the other leg, the fore quarters or hind quarters, or in severe cases of the whole body, with trembling of the muscles, dryness of the skin, and its hairs standing on end.

If the eyes and mouth are examined the membranes are found reddened to a bright rosy color. The pulse is quickened and the breathing may be slightly accelerated. At the end of a couple of days a cough is heard and a discharge begins to come from the nostrils. This discharge is at first watery; it then becomes thicker, somewhat bluish in color, and sticky, and finally it assumes the yellowish color of matter and increases greatly in quantity.

At the outset the colt may sneeze occasionally and a cough is heard. The cough is at first repeated and harsh, but soon becomes softer and moist as the discharge increases. Again the cough varies according to the source of the discharge, for in light cases this may be only a catarrh of the nasal canals, or it may be from the throat, the windpipe, or the air-tubes of the lungs, or even from the lungs themselves. According to the organ affected the symptoms and character of cough will be similar to those of a laryngitis, bronchitis, or lung fever caused by ordinary cold.

Shortly after the discharge is seen a swelling takes place under the

jaw, or in the intermaxillary space. This is at first puffy, swollen, somewhat hot and tender, and finally becomes distinctly so, and an abscess is felt, or having broken itself the discharge is seen dripping from a small opening. When the discharge from the nostrils has fully developed the fever usually disappears and the animal regains its appetite, unless the swelling is sufficient to interfere with the function of the throat, causing pain on any attempt to swallow. At the end of four or six days the discharge lessens, the soreness around the throat diminishes, the horse regains its appetite, and in two weeks has regained its usual condition. Old and strong horses may have the disease in so light a form that the fever is not noticeable; they may continue to eat and perform their ordinary work as usual and no symptom may be seen beyond a slight discharge from the nose and a rare cough, which is not sufficient to worry any but the most particular owner. But, on the other hand, the disease may assume a malignant form or become complicated so as to become a most serious disease, and even prove fatal in many cases. Inflammation of the larynx and bronchi, if excessive, will produce violent, harsh coughing, which may almost asphyxiate the animal. The large amount of discharge may be mixed with air by the difficult breathing, and the nostrils, the front of the animal, manger and surrounding objects become covered with a white foam. The inflammation may be in the lung itself (lobular pneumonia) and cause the animal to breathe heavily, heave at the flanks, and show great distress. In this condition marked symptoms of fever are seen; the appetite is lost, the coat is dry, the horse stands back in its stall at the end of the halter strap with his neck extended and his legs propped apart to favor its breathing. This condition may end by resolution, leaving the horse for some time with a severe cough, or the animal may die from choking up of the lungs (asphyxia).

The swelling under the jaw may be excessive, and if the abscess is not opened it burrows toward the throat or to the side and causes inflammation of the parotid glands and breaks in annoying fistulas at the sides of the throat and even up as high as the ears. Roaring may occur either during a moderately severe attack from inflammation of the throat (larynx), or at a later period as the result of continued lung trouble. Abscesses may develop in other parts of the body, in the poll, in the withers, or in the spaces of loose tissue under the arms, in the fold of the thigh, and, in entire horses, in the testicles.

During the course of the disease or later, when the animal seems to be on the road to perfect recovery, abscesses may form in the internal organs and produce symptoms characteristic of disease of those parts.

Delirium.—Roaring, plunging, wandering in a circle, or standing with the head wedged in a corner of the stall, indicates the collection of matter in the brain. Sudden and severe lung symptoms, without previous discharge, point to an abscess between the lungs, in the mediastinum; colic, which is often continuous for days, is the result of the

formation of an abscess in some part of the abdominal cavity, usually in the mesentery.

Pathology.—The lesions of strangles are found on the surface of the mucous membranes, essentially of the respiratory system and in the loose connective tissue fibers of the internal organs and glands, and consist of acute inflammatory changes, tending to the formation of matter. The blood is unaltered, though it is rich in fibrine, and if the animal has died of asphyxia it is found dark colored and uncoagulated when the body is first opened. If the animal has died while suffering from high fever the ordinary alterations throughout the body, which are produced by any fever not attended by alteration of blood, are found.

Treatment.—Ordinary light cases require but little treatment beyond diet, warm washes, moistened hay, warm coverings, and protection from exposure to cold. The latter is urgently called for, as lung complications, severe bronchitis, and laryngitis are often the results of neglect of this precaution. If the fever is excessive the horse may receive small quantities of Glauber salts (handful three times a day), as a laxative, bicarbonate of soda or niter in dram doses every few hours, and small doses of antimony, iodide of potash, aconite, or quinine. Steaming the head with the vapor of warm water poured over a bucket of bran and hay, in which belladonna leaves or tar have been placed, will allay the inflammation of the mucous membranes and greatly ease the cough.

The swelling of the glands should be promptly treated by bathing with warm water and flaxseed poultices, and as soon as there is any evidence of the formation of matter it should be opened. Prompt action in this will often save serious complications. Blisters and irritating liniments should *not* be applied to the throat. When lung complications show themselves the horse should have mustard applied to the belly and to the sides of the chest. When convalescence begins great care must be taken not to expose the animal to cold, which may bring on relapses, and while exercise is of great advantage it must not be turned into work until the animal has entirely regained its strength.

SCALMA.

The differentiation of the various diseases which have popularly been included under the terms of distemper and influenza up to a comparatively recent date, has been so slow and so tardily accepted by the majority of practitioners that we have been subjected to constantly seeing announced and heralded as news in the daily papers the appearance of some new disease. These new diseases of the populace and of the empiric are to us but the epizoötic outbreak or the more severely manifested form of some ordinary contagious disease. We treat several cases of different troubles in the same stable without having the time or seeing the necessity of explaining them to the owner, when suddenly one of them spreads to the rest of the stable in an epizoötic form, and

our clients will not understand that all of the animals have not suffered from the same illness.

There is, however, one of the contagious fevers of the horse which has constantly been confounded with other diseases, and which has not been separated from them in our English text-books. As this disease has received no proper name in English, I shall use for it the name given by Professor Dieckerhoff, of Berlin, who first described it in the Adams Wochenschrift, XXIX, in 1885.

Etymology.—The term "scalma" is derived from the old German word *scalmo*, *scelmo*, *schelm*, which indicates roguishness or knavishness, as great nervous irritability, especially of the temper, is one of the characteristics, almost diagnostic, symptoms of this disease. The term "*Heimtuckische Krankheit*," signifying malicious, treacherous, or mischievous, is also employed in German for the same trouble. I am not aware of any name in English or French which has been applied to it.

As I am opposed to employing in veterinary medicine any of the nomenclature of human medicine, except for identical, simple, and inflammatory diseases, or for intercommunicable contagious diseases, I will not offer the term "whooping cough" as a name, but I will suggest a certain similarity between the latter disease in man and scalma in the horse.

Definition.—Scalma is a contagious and infectious febrile disease of the horse, with local lesions of the bronchi, trachea, and larynx, which is evidenced by cough. It is further characterized by great irritability of temper. It occurs as a stable plague; that is, in enzoötic form, with, however, great variations in the susceptibility of the animals to contract it. It is rarely fatal except from complications.

Incubation.—The period of incubation is from six to seven days, but the disease may develop in two days after exposure or it may delay its appearance for ten days. It spreads through a stable slowly, developing at times in a horse placed in a stall where the previously sick one had stood, or it may pass next to an animal several stalls away. One attack is usually protective.

Symptoms.—The symptoms are ushered in by fever, in which the acceleration of the pulse and respiration is in no way in accord with the great elevation of temperature. With the appearance of the fever is developed a diffuse bronchitis, which is, however, subacute both in its character and in its course. At times the trouble of the bronchi may extend to the trachea, larynx, pharynx, or even to the nasal fossæ.

In two or three days a trifling grayish, albuminous discharge from the nostrils occurs, which continues, variable in quantity, for eight to fourteen days, or may even last for three weeks. The cough is short, rough, and painful, spasmodic in its occurrence and in character. The slight watery or slimy discharge may become more profuse, purulent, or even "rusty," if the bronchitis has extended to the neighboring structures. Pharyngeal discharge may take place. The respiration is

moderate and only affected during an excess of coughing, or in complicated cases. The pulse undergoes but little quickening. The temperature rises rapidly to 39°, 40°, and in some cases even to 41.5° C (107½° F). The latter temperature usually, but not always, indicates complication by pleurisy. In ordinary cases the temperature drops in two or three days after the appearance of the cough. The hide is dry and rough, with the hairs on end, but the horse appears rather as an animal out of condition, than a sick one. Emaciation may be rapid. The mucous membranes are moderately reddened. The appetite is diminished, but the animal chews constantly. Deglutition, either of food or water, is frequently the cause of spasms of coughing, and these in turn seem to warn the animal against attempts at swallowing. On percussion no alteration of resonance is to be detected. On auscultation of the lungs mucous râles are heard, with at times tubular breathing; the latter, however, we will study under the complications, as also the friction warning of pleurisy. Throughout the course of the disease we have still one constant and characteristic symptom—nervous irritability. With temperature of 104° to 107°F., the horse still flinches to the touch on the loins; it stands frequently with the head up, and it is on the alert for the entrance of any one to the stall. The previously good-tempered and quiet horse will turn and bite, will strike with the hind legs, or at the first touch to the side, head, or throat will half rear and back into the corner of the box, or breaking the halter turn backward out of the stall.

The course of the disease is from five to eight days, but the cough may continue for two or three weeks with variable elevation of temperature. As a stable plague the course is from two to three months, as the contagion is much more uncertain than in strangles or influenza. The termination is by resolution and recovery, or by complications. In resolution the temperature drops, the cough becomes less frequent and less spasmodic in character, the appetite returns, and no sign is left of the disease except the fever mark on the hoof.

The complications are excessive spasms and pleurisy. In the former the cough may be so violent as to convulse the whole animal, the legs are spread and fixed, with the hind ones drawn slightly under the body. The head and neck are extended, with the muscles tense. The cough comes out by rapidly succeeding efforts, or with the first sound the larynx seems to close for a moment before the rest can follow. In two cases of my own the spasm has been so great that the animal has fallen to the ground. During these accesses the respiration becomes accelerated, and on auscultation of the trachea and lungs the tubular murmur of an apparent pneumonia can be heard. This false murmur, however, disappears at the end of the attack. In the case which fell to the ground the horse would lie for a moment or two absolutely motionless. (In the first I believed that he had broken his neck.) The rapid respiration was then followed by a long inspiration, the animal regained his feet, the

respiration became almost normal and the tubular murmur had disappeared. I have seen no fatal termination from this spasm of the pneumo-gastric, but can readily believe that traumatisms resulting from such attacks might prove fatal, or that the spasm might continue long enough to produce asphyxia. The fatal complication is pleurisy. This occurs when the horse has been kept at work after the development of the disease while suffering from a high fever, and is probably in no way specific, but the result of work on an animal with high temperature. The additional symptoms are those of an ordinary pleurisy.

Diagnosis.—The diagnosis is based upon the elevation of the temperature without corresponding acceleration of the pulse and of the respirations; upon the retention of appetite and spinal reflex; with the great irritability of temper in the presence of a high temperature, and upon the spasmodic cough and auscultatory sounds of bronchitis with but trifling discharge.

The diagnosis is made from œdematous pneumonia by the absence of the yellow colorations, the absence of pneumonia, and the less continuous high temperature; from influenza by the absence of œdema, of the ochre coloration, and of the typhoid symptoms; from strangles by want of enlargement of the lymphatics, absence of purulent discharge and abscesses; from variola by the nonappearance of pustules and enlarged lymphatics; from simple bronchitis, as the latter is sporadic, and in it great fever is accompanied by profuse discharge; from rheumatic pleurisy and pleurodynia, by the history in these of repeated attacks and great temporary pain; from surgical fever by the absence of cause.

Prognosis.—The prognosis is usually favorable. This disease entails only the loss of ten days to three weeks' use of the animal, and leaves the subject with no complicating sequelæ. In some cases I have seen the irritable disposition remain for a length of time, but in every case it has finally disappeared. As I have suggested, violent spasms might prove fatal. Pleurisy would render the prognosis serious, as the same disease would when occurring from simple causes.

Treatment.—The treatment of a stable should be at once prophylactic. The infected animals should be removed, and complete disinfection of the stalls and area should be made. The individual treatment is simple. The hygienic measures of cleanliness, fresh air without drafts, frequent rubbing and tempting food should be thorough. The digestive tract is to be regulated by small doses of bicarbonate of soda, sulphate of soda, gentian and tannic acid. The appetite is to be stimulated by drinks of cold breakfast tea and cow's milk. Antispasmodics are to be used when the cough is excessive. The best of these are camphor, belladonna, stramonium, and steaming with turpentine. (Turpentine 1 ounce, water half bucket.) External frictions of alcohol and turpentine, with hot packs to the loins, will also afford relief. Quinine and salicylic acid may be used during the elevation of temperature. Professor Dieckerhoff recommends tracheal injections in ounce doses of

the following solution: Acetate of aluminium, 1 per cent.; alum, one-half to 1 per cent.; bromide of potash, 1 to 2 per cent.; water, 100.

ŒDEMATOUS PNEUMONIA.

SYNONYMS: Adynamic pneumonia; hospital or stable pneumonia; influenza; *Pectoralis equorum;* pleuropneumonia; *Contagiosa equorum; Brustseuche*, German.

Definition.—This disease is the adynamic pneumonia of the older veterinarians who did not recognize any essential difference in its nature from an ordinary inflammation of the lungs, except in the profound sedation of the force of the animal affected with it, which is a prominent symptom from the outset of the disease. Again, this same prostration of the vital force of the animal, combined with the staggering movement and want of coördination of the muscles of the animal, caused it for a long time to be confounded with influenza, with which at certain periods it certainly has a strong analogy of symptoms, but from which, as from sporadic pneumonia, it can be separated very readily if a case can be followed throughout its whole course.

Œdematous pneumonia is a specific inflammation of the lungs, producing an interstitial œdema and inflammation of the tissues of these organs, and a constitutional disturbance or fever of a low or adynamic type. It causes a profound sedation of the nervous system which may be so great as to cause death. It is sometimes attended by pleurisy, inflammation of the heart, or septic complications which also prove fatal.

Etiology.—While, as an infectious disease, its original cause is due to a specific virus, there are many predisposing causes which act as important factors in aiding in its development. Old horses, especially those which have been rendered anæmic or debilitated by hard use or by diminished quantities of food, and those which are obliged to work constantly in water or are exposed to continual cold and wet, as in the case of canal horses, old hack horses and their congeners, and those younger animals which have a sudden weakened vitality produced by being put too rapidly to work, or to too hard work before their muscles are hardened and their organs have been accustomed to the unusual demands placed upon them by want of training, are much more susceptible to the contagion than adult animals in a good condition of health. Lymphatic, narrow-chested, thick-hided and big-hoofed animals will contract the disease much more easily than the finer-skinned, richer-muscled animal of a sanguinary temperament and robust constitution.

Old, cold, damp, foul, unclean, and badly drained and ventilated stables allow rapid dissemination of the disease to other horses in the same stable, and act as rich reservoirs for preserving the contagion which, in one of these cases, the writer knew to be retained for over a year. Every few weeks during this time, in the corner of a large livery stable, one or more cases of œdematous pneumonia broke out, usually in one of

two stalls, but sometimes several stables away. When the stable was remodeled and new woodwork was placed in for mangers and floors the disease disappeared. The virus is but moderately volatile, and in a stable seems rather to follow the lines of the walls and irregular courses than the direct currents of air and the tracts of ventilation. Professor Dieckerhoff found that the contagion of influenza was readily diffusible throughout an entire stable and through any opening to other buildings, and substantiates the writer's experience that it will pass through solid walls of considerable thickness; but he also found that the contagion of œdemateous pneumonia is not transmissible at any great distance, nor is it very diffusible in the atmosphere. A brick wall 8 feet in height served to prevent the infection of other animals placed on that side of a horse ill with the disease, while others placed on the opposite side and separated from the focus of contagion only by open bars in the stall, were infected and developed the disease in its typical form.

Symptoms.—The symptoms differ slightly from those of a frank, fibrinous pneumonia, but not so much by the introduction of new symptoms as by the want of or absence of the distinct evidences of local lesions which are found in the latter disease. All of the pneumonias throughout the whole course of the trouble are less marked and less clearly defined.

At first the symptoms are latent; the animal gives a rare cough which resembles that of a heavy horse affected with a slight chronic bronchitis; it becomes somewhat dejected and dull, at times somnolent, and has a diminished appetite. This condition lasts for several days. No history can be obtained of causes for symptoms of acute trouble, and the absence of organic lesions to account for the general condition leaves the attendant, however expert he may be, in much doubt as to the nature of the trouble unless previous cases in the same stable, or special tact on the part of the veterinarian, aids in foreseeing the probable termination of the slight local trouble and commencing adynamic changes in the organic functions of the animal. No crepitant râle is heard as in fibrinous pneumonia, as in this disease the local trouble commences in the neighborhood of the large air tubes and not on the periphery of the lungs. During several days these symptoms increase and a fever of a low type gradually develops. The respiration increases to twenty-four, thirty, or thirty-six to the minute, and a small, running, soft pulse, indicating great exhaustion of the capillaries and their surrounding tissues, attains a rhythm of fifty, seventy, or even more beats in the sixty seconds. The heart, however, contrary to the debilitated condition of the pulse, is found beating violently and tumultuously, like it does in anthrax and septic intoxication. The mucous membranes of the eyes and mouth and of the genital organs are found somewhat œdematous, and they rapidly assume a dirty, saffron color, at times approaching an ocher, but distinguishable from the similar coloration in influenza by the want of the luster belonging to the latter

and by the muddy, dull tint which is characteristic throughout the disease.

Suddenly, without the preliminary râles which precede grave lesion of the lungs in other diseases, the blowing murmur of pneumonia is heard over a variable area of the chest, usually, however, much more distinctly over the trachea at the base of the neck and directly behind the shoulder on either side of the chest. In some cases the evidence of lung lesion can only be detected over the trachea. The body temperature has now reached 104°, 105°, F. or in extreme cases even a degree higher. The debility of the animal is great without the stupefaction or evidence of cerebral trouble, which is constant with such grave constitutional phenomena in influenza or severe pneumonias. The animal is subject to occasional chills, and on movement staggers in its gait. The yellow coloration of the visible mucous membrane is rendered pale by infiltration of the liquid of the blood into the tissues; the pulse may become so soft as to be almost imperceptible, the heart movement and sounds being at the same time exaggerated. The animal loses flesh rapidly, and dropsies of the extremities, of the under surface of the belly, or of the internal organs may show themselves. We then have all the general phenomena of a profound anæmia.

Terminations.—These symptoms may gradually subside; with an improved appetite the inanition may cease and the animal commence to nourish its impoverished blood and tissues; the pulse becomes stronger, the heart more regular and less tumultuous; the mucous membranes assume a brighter and more distinct color; the difficulty of respiration is removed, and the animal may make a recovery, but at best the convalescence is a long one, and in many cases it is questionable if it is an economical proceeding to carry the animal through it. More frequently the disease terminates by death. This is usually directly due to heart failure; in some cases it is caused by asphyxia, owing to the great amount of exudation into the lung tissue, rendering its further function impossible; in most cases the anæmia and marasmus debilitate the animal until it dies as it would from the same condition produced by any other cause.

Complications.—The complications of œdematous pneumonia are inflammatory or necrotic changes in the lungs themselves. Suppuration at times takes place in the bronchi and may extend to the lung tissue. In this case we may find the mucous râles of a bronchitis appearing where there were only negative signs of pulmonary trouble, or we may find them grafted upon the tubular murmur of the pneumonia if the latter had been detected in the earlier stages of the disease. These are mostly distinctly heard over the trachea and on the sides of the chest directly behind the shoulders. With the development of the mucous rales, to be heard on auscultation, we have a more purulent discharge from the nostrils, similar to that of a chronic or sub-acute bronchitis. If the inflammation has been of some standing, cavernous râles may be

heard indicating the destruction of a considerable portion of lung tissue and the formation of a cavity. The effects of this more acute inflammatory process are not appreciable in the general condition of the animal, except to still further weaken it and add to its debilitated and emaciated cachexia. Gangrene frequently occurs. A sudden rise of the body temperature one or two degrees, with a more enfeebled pulse and a still more tumultuous heart, develop simultaneously with the appearance of a discharge from the nostrils. This discharge is gray in color, serous or watery in consistency, mixed with the detritus of broken-down lung tissue, and sometimes contains clots of blood, or in more serious cases may be marked by a quantity of fluid blood from a hemorrhage, which proves fatal. The discharge is fetid to the smell. The animal emaciates rapidly. On examination of the lungs mucous râles are heard in the larger bronchi, cavities may be found at any part of these organs, and points of lobular pneumonia may be detected.

Diagnosis.—The diagnosis of œdematous pneumonia at the outset is aided greatly by a rigid examination of the surroundings, and still more so by the history or knowledge of previous cases in the same stable. The cough and commencing fever of the first few days have nothing diagnostic in them, but when combined with repeated chills, a soft pulse, a tumultuous heart, the rapidly stained dull yellow mucous membranes, and the staggering gait of the animal without marked brain trouble, the diagnosis becomes more easy. In pneumonia the fever is always of a more sthenic character, the fever is concomitant, or precedes the marked lung trouble; the yellowish discoloration is a phenomenon of the later stages of the disease; the debility of the muscles is simple weakness, or, if complicated by want of coördination, it accompanies an evident brain trouble and loss of consciousness. In pneumonia there has always been in the lungs the regular series of absence of vesicular murmur, crepitant râles, and then tubular murmur. While the pulse in a simple pneumonia may in the later stages become very soft and weak, it commences as a tense and full one. The heart only becomes irregular as the result of cardial complication, and never assumes the tumultuous character of the septic diseases unless gangrene occurs, in which case the animal is only of value as a scientific study to the veterinary attendant. In influenza the symptoms of fever develop before any local lesions are noticed. The feebleness of the muscles and want of coördination are from the outset the evident result of a poisoned condition of the brain, as shown by the stupor of the animal; the saffron or ochre coloration of the visible mucous membrane is of a decided tint, and while these membranes may be œdematous, they become so as the result of an increase in the quantity of blood in their capillaries, or by congestion, and not from the œdematous infiltration of the watery portion of the blood as in the disease in question.

Prognosis.—Œdematous pneumonia is an excessively fatal disease. We have seen that it usually attacks animals which are already in more

or less of a depraved condition or weakened in their vital forces by the bad hygienic surroundings to which they have been subjected. Rapid increase in the area of infiltration in the lungs, as shown by dullness on percussion and the extent of the tubular murmur, is an unfavorable symptom. Increased prostration in the early part of the disease augurs badly for the chances of future resistance to the effects of the local lesions. Suppuration with the formation of abscesses and gangrene in the lungs are even more serious in this disease than as a complication of other diseases, on account of the debilitating character of the original trouble.

Alterations.—At the time of death from œdematous pneumonia we frequently find septic changes and the evidences of putrefaction. The solidification of the lung tissue is found irregular in shape and high up around the root of the lungs and around the large bronchi, and is generally covered by sound lung tissue. The anterior lobes of the lungs are usually entirely affected. The diseased portion appears of a gray-yellowish color, somewhat watery, and tears readily. Matter is found in the air tubes which form gutters through the jelly-like mass of the diseased lung. Abscesses, from the size of a nut to larger masses, may be found disseminated through the lungs. The blood is dark in color, fluid, or only clotted into soft, jelly-like masses. Masses of gangrenous or dead black tissue may be present.

Treatment.—A study of the symptoms will indicate at once that the antiphlogistics, or those remedies which we employ in such sthenic diseases as fibrinous pneumonia, strangles, etc., are not to be employed in this disease. Bleeding would only still further weaken an already enfeebled animal; antimony or the alterants would increase the depression of a too depraved constitution. There is in this disease no acute congestion of a particular organ to draw off by depletive measures, nor any violent blood current to be retarded, for fear of hyper-nutrition of any special part.

Revulsives do good, as they excite the nervous system and awaken the torpor of the weakened blood vessels, which aid in the reëstablishment of the functions. Mustard poultices may be applied over the belly and sides of the chest, as in other diseases, but caution must be used in the employment of blisters, as ugly ulcers may result from their action on a tissue of weakened vitality. Setons are dangerous from the great tendency in this disease to septic complications. Repeated friction of the legs by hand-rubbing and warmth by bandaging and by rubbing the surface of the body with turpentine and alcohol, which is immediately to be dried by rough towels, will excite the circulation and stimulate the emunctories of the skin.

Stimulants are given internally from the outset of the disease. Turpentine in dram doses regulates the heart and excites the kidneys to carry off waste matter, but if repeated too frequently may disturb the already delicate digestive system. Alcohol rectifies the latter danger,

and is a useful stimulant to the heart and digestive system, if given with care in small doses. It must be remembered that this remedy is not a food. It is a hydrocarbon which is not burnt, but is eliminated in the urine and in the expired air. If given in too large quantities it becomes a depressant, and lowers the vitality of all of the tissues of the body, as can too frequently be seen in the mental and physical condition of the drunkard. It is an antiputrid, and is especially indicated when septic complications and gangrene are present. The aromatics and bitter tonics are useful; gentian, tannin, and English breakfast tea in warm decoction from a useful menstruum for other remedies. The various preparations of iron are astringents and excitants to the digestive system. Carbolic acid is an antiputrid, which is of marked benefit in œdematous pneumonia; it should be given in small doses diluted in alcohol.

Salicylic acid may be given in 1 or 2 dram doses every few hours. It is a specific for troubles of the serous membranes, lowers the temperature, and is of value in this disease in preventing the exudation into the tissue of the lungs. The alkalines, as the sulphate and bicarbonate of soda, the nitrate of potash, and very small doses of the iodide of potash should be employed to regulate the digestive tract, the kidneys, and the other excreting glands, and to stimulate absorption of the waste matter.

The diet demands the strictest attention from the outset. In many of the fevers the food has to be diminished in quantity and regulated in the quality of its heat-producing components during the acute part of the disease, so as to lessen the material for combustion in the inflamed organs. In œdematous pneumonia, on the contrary, all the food that can possibly be digested and assimilated must be given. Choice must be made of the richest material which can be handled by the weakened stomach and intestines without fatiguing them. Good, sound hay should be chopped short and dampened or partly boiled; in the latter case the hay tea can be reserved to use as a drink. Oats may be preferred dry or in other cases will be taken better scalded; in most cases, however, it is better to give slops of oatmeal, to which can be added a little bran, barley flour, or boiled milk and wheat flour. Pure cow's milk, not too rich in fatty matter, can be given alone or with beaten eggs; frequently the horse will have to be coaxed with the milk diluted with several parts of water at first, but will soon learn to drink the pure milk. Apples and carrots cut up raw or boiled are useful, and fresh clover in small quantities will frequently stimulate the appetite. Throughout the course of the disease and during convalescence the greatest attention must be taken to cleaning the coat thoroughly so as to keep the glands of the skin in working order, and light, warm covering must be used to protect the animal from cold or draughts of air.

HORSEPOX—EQUINE VARIOLA.

SYNONYMS: *Variola equina—Pustular Grease—Phlyctenoid Herpes.*

Definition.—The horsepox is a specific infectious fever of the horse attended by an eruption of pustules or pocks over any part of the skin or on the mucous membranes lining the various cavities in the body. When the eruption takes place on the mucous membrane of the respiratory tract it produces an irritation and discharge of matter which greatly resembles that of strangles. This disease was for a long time confounded with the latter disease, and there is no doubt that many light cases in which the eruption is not well marked are still mistaken for distemper.

The horsepox was described by the early Roman agricultural writers and by the veterinarians of the last century. It received its first important notice from the great Jenner, who confounded it with grease in horses, as animals with this disease are very apt to have the eruption of variola appear on the inflamed fetlocks if they are affected with grease at the same time. He saw these cases transmit the disease to cattle in the byres and to the stablemen and milkmaids who attended them, and furnish the latter with immunity from smallpox, which led to the discovery of vaccination. The horsepox is again frequently mistaken for the exanthemata attending some forms of venereal disease in horses.

Variola in the horse, while it is identical in principle, general course, complications, and lesions with variola in other animals, is a disease of the horse itself, and is not transmissible in the form of variola to any other animal; nor is the variola of any other animal transmissible to the horse. Cattle and men, if inoculated from a case of horsepox, develop vaccinia, but vaccinia from the latter animals is not so readily reinoculated into the horse with success. If it does develop, it produces the original disease.

Etiology.—The direct cause of the horsepox is infection. A large number of predisposing causes favor the development of the disease as in the case of strangles, for this trouble, like almost all contagious diseases, renders the animal which has had one attack immune from future ones. The causes are, young age, for then the animal is still susceptible to contract the disease, but old horses which have not been affected are less apt to become infected when exposed than younger ones. The exposure incident to shipment through public stables, cars, etc., again acts as a predisposing cause as in the other infectious diseases. The period of final dentition is a moment of the animal's life which renders it peculiarly susceptible.

Dupaul states that the infection is transmissible through the atmosphere for several hundred yards. The more common means of contagion is by direct contact or by means of fomites. Feed boxes and bridles previously used by horses affected with variola are probably the

most frequent carriers of the virus, and we find the lesions in the majority of cases developed in the neighborhood of the lips and nostrils. Coition is a frequent cause. A stallion suffering from this disease may be the cause of a considerable epizoötic, as he transmits it to a number of brood mares and they in turn return to the farms where they are surrounded by young animals to whom they convey the contagion. The saddle of the harness and croup straps are frequent agents of infection. The presence of a wound greatly favors the inoculation of the disease, which is also sometimes carried by surgical instruments or sponges. Trasbot recites a case, in which a set of hobbles, which had been used on an animal suffering from variola, were used on a horse for a quittor operation and transmitted the disease which developed on the edges of the wound. There is no elective point for the first development of the disease, but it commences most frequently around the natural openings, as these are the points which are most exposed to inoculation.

Symptoms.—There is a period of incubation, after an animal has been exposed, of from five to eight days, during which there is no appreciable alteration in the health. This period is shorter in summer and longer in winter. At the end of this time, small nodes develop at the point of inoculation and the animal becomes feverish. The nodes, which feel like small shot under the skin, soften into small pustules and break into little, shallow, superficial ulcers, exuding a creamy, thick matter, which rapidly dries and forms scabs. The horse is dull and dejected, loses its appetite, and has a rough dry coat with the hairs on end. There is moderate thirst. The respirations are somewhat quickened and the pulse becomes rapid and full. The body temperature is elevated, frequently reaching 104° or 105° F., within thirty-six or forty-eight hours from the appearance of the first symptoms.

The visible mucous membranes, especially the conjunctivæ, are of a bright rosy red. In the lymphatic, cold-blooded, and more common horses these symptoms of fever are less marked; even with a comparatively high temperature the animal may retain its appetite and even work comparatively well, but these cases, if worked and overheated, are apt to develop serious complications.

At the end of from three and a half to four days the eruption breaks out, the fever abates, and the general symptoms improve. The eruption in severe cases may be generalized; it may be confined to the softer skin of the nose and lips, the genital organs, and the inside of the thighs, or it may be localized in the neighborhood of a wound or in the irritated skin of a pair of greasy heels. It consists of a greater or less number of little nodes which, on a mucous membrane, as in the nostrils or vagina, or on soft unpigmented skin, appear red and feel at first like shot under the epidermis. These nodes soften and show a yellowish spot in the center when they become pustules. The epidermis is dissolved and the matter escapes as a viscid fluid at first citrine and later cloudy and purulent, which dries rapidly, forming scabs; if these fall

off or are removed they leave a little shallow concave ulcer which heals in the course of five or six days. In the softer skin if pigmented the cicatrices are white and frequently remain so for about a year, when the pigment returns. The lips or genital organs of a colored horse, if covered with a number of small white spots about the size of a pea, will usually indicate that the animal has been affected with the horsepox.

At times the pustules may become confluent and produce large superficial serpentine ulcers on the membrane of the nostrils, around the lips or eyelids, or on the borders of wounds and in greasy heels; in this case the part becomes swollen, hot, painful, and is covered with a profuse discharge of matter. In this form there is frequently a secondary fever lasting for a day or two.

In severe cases there may be a suppurative adenitis or inflammation of the lymphatic glands which are fed from the affected part. If the eruption is around the nostrils and lips, the glands between the jaws (submaxillary) form abscesses, as in a case of strangles; if the eruption is in a pair of greasy heels abscesses may form in the fold of the groin (inguinal). There may be so much tumefaction of the nostrils as to produce difficulty in breathing.

Complications.—A case of horsepox may be attended with various complications of greater or less importance. Adenitis or suppuration of the glands has just been mentioned. Confluent eruptions irritate the part and induce the animal to rub the inflamed part against the manger or scratch it in other ways, and produce troublesome ulcers, which may leave ugly scars. Irritation of the mucous membrane of the nose causes severe coryza with purulent discharge.

The eruption may occur in the throat or in the air tubes to the lungs, developing an acute laryngitis or bronchitis. These commence with a harsh cough, which becomes moister and more fatty as the discharge increases, and is followed for several days by a fever, which is often severe. If the larynx is affected it becomes inflamed and swollen, causing the animal to roar and discharge quantities of foamy mucous and matter from the nostrils, as in troubles of the same organ from other causes. If the animal is exposed to cold, or worked so as to engorge the lungs with blood at the termination of the specific fever, just when the eruption is about to localize, it may be determined to the lungs. In this case we have a short dry cough, labored breathing, the development of a secondary fever of some gravity, and all of the external symptoms of a pneumonia. This pneumonia differs, however, from an ordinary pneumonia in the symptoms furnished by the examination of the lungs themselves. In place of a large mass of the lung tissue being affected the inflammation is disseminated in smaller spots over the entire lung. The total of these areas may be equal, however, to the half or more of the lungs and prove fatal. The crepitant rales and tubular murmur of pneumonia is absent, and is replaced by sibilant and small mucous rales. When the fever has been intense and the

animal is unduly exposed or worked, it may be attacked with a congestion of the lungs, which will prove fatal within a few hours, and no localization be developed; or, if in this case relief is afforded, it may be followed by a lobar pneumonia, showing itself with all the symptoms of this disease when it is produced by ordinary causes.

Diagnosis.—The diagnosis of the horsepox is to be based on the presence of a continuous fever, with rosy mucous membranes, for several days, and the appearance of the characteristic eruption. If the eruption is in the nasal cavities, marked by a considerable discharge and attended by submaxillary abscesses, it may be confounded with strangles. If the throat is affected it may be confounded with an angina (laryngitis or pharyngitis), but in the latter the local trouble precedes or is concomitant with the fever, while in the former the fever precedes the local trouble by several days. Variola may be confounded with bronchitis or pneumonia if complicated with these troubles and the eruption is absent from the exterior, but it is of little moment, as the treatment for both will be much the same. When the eruption is in the neighborhood of the genital organs this disease has been mistaken for the dourine. In variola the eruption is a temporary one; the nodes and pustules are followed by shallow ulcers and rapid cicatrization, unless continued in the vagina or on the penis by the rubbing of the walls and filth which accumulates; there are apt to be pustules at other parts of the body. In the venereal disease the local trouble commences as a papule and breaks into an ulcer without having formed a pustule. The ulcer has not the convex rosy appearance of that of the less serious discharge; the symptoms last for a longer period, by which time others aid in differentiating the two. In glanders the tubercle is hard, and, after breaking into an ulcer, the indurated bottom remains, grayish or dirty-white in color, ragged and exuding a viscous, oily discharge. There is no disposition to suppuration of the neighboring glands. In variola the rosy shallow ulcer and healthy laudable pus, with the acutely tumified glands, should not be mistaken, at least after a day. I have seen acute glanders in mules which required a day's delay to differentiate from strangles; at that time the farcy buds appeared.

Prognosis.—The average case of the horsepox runs a course of dejection, loss of appetite, and more or less fever for about four days, followed by a rapid convalescence, and leaves the animal as well and as sound as before. If the eruption has been excessive or confluent, the ulcerations may act as irritants and render the animal unfit for use for several weeks. Laryngitis, pharyngitis, bronchitis, and pneumonia in this disease are not of greater gravity than they are when occurring from other causes. The spots denuded of pigment left by the pustules on the lips and genitals may temporarily depreciate the value of the animal to a slight degree.

Treatment.—As this is a disease unattended by alterations of the blood itself, although a specific fever, and is of a sthenic type, active

remedies are admissible and indicated. The horse should be placed on a low diet—little or no oats—bran mashes, a moderate quantity of good sound hay, a few carrots or apples, which will act as laxatives, and slop feed. Barley flour is more cooling for mashes than bran or oat meal. Water may be given as the animal desires it, but it should not be cold; if a half bucketful of water is kept in the manger the horse will take but a few swallows at a time. Dram doses of nitrate of potash, or ounce doses of sweet spirits of niter are useful in the drinking water. If the fever is high the antipyretics are indicated: Tincture of aconite in fifteen to twenty drop doses; sulphate of quinine in dram doses; iodide of potash in dram doses; two or three half-dram doses of tartar emetic or Kermes mineral are often useful; bleeding will often reduce the temperature at once and prevent complications, but is sometimes the cause of an ugly inflammation surrounded by an eruption in the neighborhood of the wound; infusion of pine tops, of juniper leaves, of the aromatic herbs, or of English breakfast tea are useful in the later stages. If complications of the air passages or lungs are threatened a large mustard poultice should be applied to the belly and sides of the chest. Oxide of zinc ointment should be used on confluent eruptions, and if the ulceration is excessive it may have to be touched with caustic.

Great care must be taken to keep the animal protected from cold draughts of air or other exposure. Blankets or sheets should be used on the body and bandages on the legs. After convalescence is established nutritious food of easy digestion and walking exercise are all that is needed, except perhaps a little Glauber's salts, to prevent constipation.

Prophylactic treatment.—When the horsepox breaks out amongst a large number of horses, especially on a farm where there are a number of colts, it may be assumed that the greater majority will contract the disease, and it is more economical that they should have it and be through with it at once. If the weather is moderate all the animals which have not been affected can be inoculated, which will produce the disease in a mild form, with the eruption at a point of election, and render the danger of complication a minimum one. For inoculation the discharge from the pustules of a mild case should be selected and inoculated by scarification on the belly or the under surface of the neck.

ANTHRAX.

SYNONYMS.—*Sacer ignis*, *Pustula maligna*, *Anthrax*, Latin; *Charbon*, *Sang de Rate*, French; *Miltzbrand*, German; *Carbone*, *Carbonchio*, *Fuoco de St. Antonio*, Italian; *Jaswa*, *Siberskaji Jaswa*, Russian; *Carbuncle*, *Splenic Fever*, *Splenic Apoplexy*, *Braxy* (in sheep), etc.

Anthrax is a severe and usually fatal contagious disease, characterized by chills, great depression and stupor of the animal, and a profound alteration of the blood, due to destruction of the red blood corpuscles. It is caused by the admission into the animal body of bac-

teria, or low order of living organisms, or their spores, known as the "*bacillus of Davaine*" or "*bacillus anthracis.*"

It affects all animals exposed to its contagion. The herbivora are especially susceptible in the following order: the sheep, the ox, and the horse. The Guinea pig, the hog, the rabbit, mice, and other animals die quickly from its effects. Man, the dog, and other omnivora and carnivora may be attacked by it in a constitutional form as fatal as in the herbivora, but fortunately, in some cases, develop from it only local trouble, followed by recovery. Fowls may be inoculated and develop the disease if they are partially immersed in cold water, to *reduce* their natural body temperature from 104° to about 100° F. Frogs may be inoculated successfully if kept in warm water, which will *elevate* their body temperature to one approximating that of the warm-blooded animal, 96°–98° F.

Anthrax has been a scourge of the animals of the civilized world since the first written history we have of any of their diseases. It existed in Asia Minor at the time of the siege of Troy; it was a plague of the cattle of Egypt during the time of Moses. It was a severe pest among the agricultural animals in the early Greek and Roman days, and we have very accurate accounts of its symptoms from the writings of Columella, Varro, Virgil, and others. By the writers of the Middle Ages it was frequently confounded with the rinderpest, but is described with sufficient precision to identify outbreaks of it in epizoötic form in 996 A. D. and 1090 A. D. in France; in 1552 at Lucca, Italy; in 1617 at Naples, where numbers of human beings died from eating the flesh of animals which were affected with the disease.

In 1598 the senate of Venice interdicted the sale of meat, butter, or cheese coming from animals affected with anthrax. In 1709–1712 A. D. extensive outbreaks of anthrax occurred in Germany, Hungary, and Poland. In the first half of the present century it had become an extensively spread disease in Russia, Holland, and England, and for the last century has been gradually spreading in the Americas; more so in South America. In 1864, in the five governments of Petersburg, Novgorod, Olonetz, Twer, and Jaroslaw, in Russia, over ten thousand horses and nearly one thousand persons perished from the disease.

The causes of anthrax were for a long time attributed entirely to climatic influence, soil, and atmospheric temperature, and they are still recognized as most important predisposing factors in the development of the disease, for it is usually found, especially when outbreaks over any number of animals occur, in low, damp, marshy countries during the warm seasons. It is more frequent in districts where marshy lands dry out during the heat of summer and are then covered with light rains. Decaying vegetable matter seems most favorable for nourishing and preserving the virus.

The direct cause of anthrax is always contagion or infection of a previously sound animal, either directly from a diseased animal or through

various media which contain excretions or the débris from the body of a previously infected animal. The specific virus of anthrax was first discovered by Davaine in 1851. He recognized in the blood of animals suffering from anthrax microscopic bodies in the form of little rods with bright spots at their extremities. It was not, however, till a quarter of a century later that Pasteur defined the exact nature of the bacillus, the mode of its propagation, and its exact relationship to anthrax as the sole cause of the disease. The bacillus of Davaine, or the virus of anthrax, is a low organism, in the form of a rod with a bright spot or spore at either end, which develops in the blood of an animal, or in other favorable media, as chicken broth or meat jellies kept at the temperature of the animal body. In the animal body the bacilli have a tendency to be filtered from the blood by the tissues of the organs through which the fluid passes, and to accumulate in the spleen, liver, and elsewhere, so that these organs are much more virulent than the muscles or less vascular tissues. When eliminated from the animal in the excretions, or when exposed to outside influences by the death of the animal and the disintegration of the tissues, the body of the rod is destroyed and the spores only remain. These spores, which are the germs of the virus, retain their vitality for a long period; they resist ordinary putrefaction; they are unchanged by moisture, and they are not affected by moderate heat. If scattered with the débris of a dead animal on the surface of the ground, they may remain around the roots of the grass in a pasture, or may be washed to the nearest low-lying ground or marsh. If buried in the body of an animal dead from anthrax, they may be washed deep in the ground, and in later years (in one proven case seventeen years) be brought to the surface and infect other animals. They are frequently brought to the surface of the earth, having been swallowed by earthworms, in the bodies of which they have been found.

This accounts for the outbreaks at the time of the first rains after a dry season. During the latter the earthworm goes deep in the ground in search of moisture; it finds the spore which has been washed there in past years, swallows it, and brings it to the surface, when the rain furnishes the moisture which drives the worm itself from its deeper home. The virus is carried with the wool from infected sheep and remains in it through the process of manufacture into cloth. The spores remain in the hides of animals which have died of anthrax and retain their vitality throughout months of soaking in the tanners' pits, the working of the harness-maker or the cobbler and after the oiling of the completed leather. The dried spores in the dust from any of these products may be carried by the atmosphere.

Infection of an animal takes place through inoculation or contact of the bacillus or its spores with an abraded surface or mucous membrane on a sound animal. In an infected district horses may eat the rich pasturage of spring and early summer with impunity, but when grass becomes low they crop it close to the ground, pull up the roots around

which the virus may be lodged, and under these conditions the animals are more apt to have abrasions of the lips or tongue by contact with dried stubble and the dirt on the roots, which favors the introduction of the germs into the system. The virus may be introduced with food and enter the blood-vessel system from the stomach and intestines. If contained in the dust, dried hay, or on the parched pasture of late summer, the virus may be inhaled and be absorbed from the lining of the lungs. If contained in harness leather, it needs but an abrasion of the skin, as the harness rubs it, to transfer the spore from the leather to the circulation of the animal.

The writer saw a case of anthrax occur in a groom from the use of a new horse brush. The strap which passes over the back of the hand inoculated an abrasion on the knuckle of the first finger, and in twelve hours a "pustule" had formed and the arm had become affected.

Symptoms.—The symptoms of anthrax develop with extreme rapidity; they are frequently so sudden that it appears but a few minutes for the animals to have passed from a condition of perfect health to a dangerously diseased one. The horse is dejected and falls into a state of profound stupor, attended by great muscular weakness. The feeble, indolent animal, if forced to move, drags its legs. There are severe chills, agitation of the muscles, symptoms of vertigo, and at times colicky pains. The mucous membranes turn a deep ochre or bluish-red color. The body temperature is rapidly elevated to 104° and 105° F. The breathing is increased to thirty or forty respirations in the minute and the pulse is greatly accelerated, but the arteries are soft and almost imperceptible, while the heart-beats can be felt and heard, violent and tumultuous. In other words, it resembles a very severe case of influenza, except in regard to the heart's action. The symptoms last but two, three, or four days, at most, when the case usually terminates fatally. An examination of the blood shows a dark fluid which is not clot, and which remains black after exposure to the air. After death the bodies putrify rapidly and bloat up; the tissues are filled with gases and a bloody foam exudes from the mouth, nostrils, and anus, and frequently the mucous membranes of the rectum protrude from the latter. The hairs detach from the skin. Congestion of all the organs and tissues is found, with interstitial hemorrhages. The muscles are friable and are covered with ecchymotic spots. This is specially marked in the heart.

The black, uncoagulated and incoaguable blood shows an iridescent scum on its surface, which is due to the fat of the animal dissolved by the ammonia, produced by the decomposed tissues. The serum oozes out of every tissue and contains broken-down blood, which, when examined microscopically, is found to have the red globules crenated and the leucocytes granular. A high power of the microscope also reveals the bacteria in the shape of little rod-like bodies of homogeneous texture with their brilliant spores.

The lymphatic ganglia are increased four, five, six, or ten times their natural size, enlarged by the engorgement of blood. The spleen shows nodulated black spots containing a muddy blood, which is found teeming with the virus. The mucous membranes of the intestines are congested and brown; the surface of the intestines is in many places denuded of its lining membrane, showing fissures and hemorrhagic spots. The liver has a cooked appearance; the kidneys are congested and friable; the urine is red; the pleura, lungs, and the meninges are congested and the bronchi of the lungs contain a bloody foam.

En résumé: The symptoms are those which are found in any disease with a rapidly decomposing blood.

The treatment of anthrax was entirely useless and ineffectual until within a comparatively few years. The curative treatment, for which almost every drug in the pharmacopœia has been used, was without avail, except, perhaps, the use of iodine, injected in the circulation in as large quantities as could be tolerated by the system. This treatment gives good results in the human being, but requires too much personal attention to be economical in animals when the disease occurs in epidemic form, although it may be used in the horse when occurring in an animal of great value.

The prophylactic treatment formerly consisted in the avoidance of certain fields and marshes which were recognized as contaminated during the months of August and September and had been occupied the years in which the outbreaks usually occurred. It underwent, however, a revolution after the discovery by Pasteur of the possibility of a prophylactic inoculation which granted immunity from future attacks of the disease equal to that granted by the recovery of an animal from an ordinary attack of the disease.

This treatment consists in an artificial cultivation of the virus of anthrax in broths, jellies, or other media, and in the treatment of it by means of continued exposure to the atmosphere or to a high temperature for a certain length of time, which weakens the virus to such an extent that it is only capable of producing an ephemeral fever in the animal in which it is inoculated, and which yet has retained a sufficient amount of its power to protect the animal from inoculation of a stronger virus. The production of this virus, which is carried on in some countries at the expense of the government and is furnished at a small cost to the farmers in regions where the disease prevails, in this country is made only in private laboratories.

GLANDERS.

SYNONYMS: *Glanders*, *Farcy*, *One form of Nasal Gleet*, English; *Malleus humidus*, *Equina nasalis*, *Equina apostematos*, Latin; *Rotz*, *Rotzkrankheit*, German; *Snot*, *Verroting*, Dutch; *Moccio*, *Ciamorro*, Italian; *Muermo*, Spanish; *Morve*, *Farcin*, French.

Definition.—Let it be understood at the outset that glanders and farcy are one and the same disease, differing only in that the first term is applied to the disease when the local lesions predominate in the internal organs, especially in the lungs and the air tubes; and that the second term is applied to it when the principal manifestation is an outbreak of the lesions on the exterior or skin of the animal. The term glanders applies to the disease in both forms, while the term farcy is limited to the visible appearance of external trouble only; but in the latter case internal lesions always exist, although they may not be evident.

Glanders is a contagious constitutional disease of the *genus equus* (the horse, ass, and mule), readily communicable to man, sheep, goats, to dog, the cat, the rabbit, and Guinea pig. It runs a variable course until it produces the death of the animal affected with it. It is characterized by the formation of neoplasms of connective tissue, or tubercles which degenerate into ulcers from which exudes a peculiar discharge. It is accompanied by a variable amount of fever according to the rapidity of its course. It is subject to various complications of the lymphatic glands, of the lungs, of the testicles, of the internal organs, and of the subcutaneous connective tissue.

History.—Glanders is one of the oldest diseases of which we have definite knowledge in the history of medicine. Absyrtus, the Greek veterinarian in the army of Constantine the Great, described this disease with considerable accuracy and recognized the contagiousness of its character. Another Greek veterinarian, Vegetius Renatus, who lived in the time of Theodosius (381 A. D.), described under the name of *malleus humidus*, a disease of the horse characterized by a nasal discharge and accompanied by superficial ulcers. He recognized the contagious properties of the discharge of the external ulcers, and recommended that all animals sick with the disease should be separated at once with the greatest care from the others, and should be pastured in separate fields for fear the other animals should become affected.

In 1682 Sollysel, the stable-master of Louis XIV, published an account of glanders and farcy, which he considered closely related to each other, although he did not recognize them as identical. He admitted the existence of a virus which communicated the disease from an infected animal to a sound one. He called special attention to the feed-troughs and water-buckets as being the medium of contagion. He divided glanders into two forms, one malignant and contagious, and the other benign, and he stated that there was always danger of infection.

Garsault, in 1746, said "that as this disease is communicated very easily, and can infect in a very short time a prodigious number of horses by means of the discharges which may be licked up, animals infected with glanders should be destroyed."

Bourgelat, the founder of veterinary schools, in his "Elements of Hippiatary," published in 1755, establishes glanders as a virulent disease. Extensive outbreaks of glanders are described as prevailing in the

great armies of continental Europe and England from time to time during the periods of all the wars of the last few centuries.

Glanders was imported into America at the close of the last century, and before the end of the first half of the present century had spread to a considerable degree among the horses of the Middle and immediately adjoining Southern States. This disease was unknown in Mexico until carried there during the Mexican war by the badly diseased horses of the United States Army. During the first half of the present century a large school of veterinarians and medical men protested against the contagious character of this disease, and prevailed by their opinion to such an extent against the common opinion that several of the governments of Europe undertook a series of experiments to determine the right between the contesting parties.

At the veterinary school at Alfort, and at the farm of Lamirault in France, several hundred horses which had passed examination as sound had placed among them glandered horses under various conditions. The results of these experiments proved conclusively the contagious character of the disease.

In 1881 Professor Bouchard, of the faculty of medicine in Paris, assisted by Drs. Capitan and Charrin, undertook a series of experiments with matter taken from the farcy ulcer of a human being. They afterward continued their experiments with matter taken from animals of the equine genus. In 1883 these gentlemen presented the results of their researches to the Academy, through Professors Bouley and Vulpiam, conclusively demonstrating that the disease was caused by a bacterium or low order of parasitic organism, which is capable of propagation and reproduction of others of its own kind if placed in the proper media.

When we come to study the etiology of glanders, the difference of susceptibility on the part of different species of animals, or even on the part of individuals of the same species, and when we come to find proof of the slow incubation and latent character of the disease as it exists in certain individuals, we will understand how in a section of country containing a number of glandered animals others can *seem* to contract and develop the disease without having apparently been exposed to contagion.

Etiology.—The contagious nature of glanders, in no matter what form it appears, being to-day definitely demonstrated, we can recognize but one cause for all cases, and that is contagion by means of the specific virus of the disease.

In studying the writings of the older authors on glanders, and the works of those authors who contested the contagious nature of the disease, we find a large number of predisposing causes assigned as factors in the development of the malady.

While a virus from a case of glanders if inoculated into an animal of the genus equus will inevitably produce the disease, we find a vast difference in the contagious activity of the products of different cases

of glanders. We find a great variation in the manner and rapidity of the development of the disease in different individuals, and we find that the contagion is much more apt to be carried to sound animals under certain circumstances than it is under others. Only certain species of animals are susceptible of contracting the disease, and while some of these contract it as a general constitutional malady, in others it only develops as a local sore.

In acute glanders the contagion is found in its most virulent form, as is shown by the inevitable infection of susceptible animals inoculated with the disease, while the discharge from chronic semilatent glanders and farcy may at times be inoculated with a negative result; again, in acute glanders, as we have a free discharge, a much greater quantity of virus-containing matter is scattered in the neighborhood of an infected horse to serve as a contagion to others than is found in the small amount of discharge of the chronic cases.

The chances of contagion are much greater when sound horses, asses, or mules are placed in the immediate neighborhood of glandered horses, drink from the same bucket, stand in the next stall or work in the same wagon, or are fed from the same bales of hay or straw which have been impregnated by the saliva and soiled by the discharge of sick animals. The contagion must terminate by direct contact of the discharges of a glandered animal with the tissues of a sound one, either on the exterior or when swallowed mixed with food into the digestive tract.

Glanders is not infectious in the old acceptation of the word. Renault made a large number of experiments, forcing sound horses to breathe the expired air of glandered horses for an hour and a half a day for seven days, by means of a tube of canvas, and was unable to produce the disease in any case.

The stable attendants serve as one of the most common carriers of the virus. Dried or fresh discharges are collected from the infected animal in cleaning, harnessing, feeding, and by means of the hands, clothing, the teeth of the currycomb, the sponge, the bridle, and halter, and are carried to other animals.

An animal affected with chronic glanders in a latent form is moved from one part of the stable to another, or works hitched with one horse and then with another, and may be an active agent in the provocation of the disease without the cause being recognized.

Glanders is found frequently in the most insidious forms, and we recognize that it can exist without being apparent; that is, it may affect a horse for a long period without showing any symptoms that will allow even the most experienced veterinarian to make a diagnosis. An old gray mare belonging to a tavern keeper was reserved for family use with good care and light work for a period of eight years, during which time other horses in the tavern stable were from time to time affected with glanders without an apparent cause. The mare, whose only trouble was an apparent attack of heaves, was sold to a huckster, who

placed her at hard work. Want of feed and overwork and exposure rapidly developed a case of acute glanders, from which the animal died, and at the autopsy were found the lesions of an acute pneumonia of glanders grafted on chronic lesions, consisting of old tubercles, which had undoubtedly existed for years.

In a recent case under the care of the writer a coach horse was examined for soundness and passed as sound by a prominent veterinarian, who a few months afterwards treated the horse for a skin eruption from which it recovered. Twelve months afterwards it came into the hands of the writer, hidebound, with a slight cough and a slight eruption of the skin, which was attributed to clipping and the rubbing of the harness, but which had nothing suspicious in its character. The horse was placed on tonics and put to regular light driving. In six weeks it developed a bronchitis without having been specially exposed, and in two days this trouble was followed by a lobular pneumonia and the breaking of an abscess in the right lung. Farcy buds developed on the surface of the body and the animal died. The autopsy showed the existence of a number of old tubercles in the lungs which must have existed previous to purchase, more than a year before.

Public watering troughs and the feed boxes of boarding stables and the tavern stables of market towns are among the most common recipients for the virus of glanders, which is most dangerous in its fresh state, but cases have been known to be caused by feeding animals in the box or stall in which glandered animals had stood more than a year before. While the discharge from a case of chronic glanders is much less apt to contain the virus than that from a case of acute glanders, the former, if it infects an animal, will produce the same disease as the latter. It may assume from the outset an acute or chronic form according to the susceptibility of the animal infected, and this does not depend upon the character of the disease from which the virus was derived.

The genus equus, the horse, the ass, and the mule, are the animals which are the most susceptible to contract glanders, but in these we find a much greater receptivity in the ass and mule than we do in the horse. In the ass and mule in almost all cases the period of incubation is short and the disease develops in an acute form. We find that the race of horse infected influences the character of the disease; in full-blooded, fat horses, of a sanguinary temperament, the disease usually develops in an acute form, while in the lymphatic, cold-blooded, more common race of horses, the disease usually assumes a chronic form. If the disease develops first in the chronic form in a horse in fair condition, starvation and overwork are apt to bring on an acute attack, but when the disease is inoculated into a debilitated and impoverished animal it is apt to start in the latent form. Inoculation on the lips or the exterior of the animal is frequently followed by an acute attack, while infection by ingestion of the virus and inoculation by means of the digestive tract is often followed by the trouble in the chronic latent form.

In the dog the inoculation of glanders may develop a constitutional disease with all the symptoms which are found in the horse, but more frequently the virus pullulates only at the point of inoculation, remaining for some time as a local sore, which may then heal, leaving a perfectly sound animal; but while the local sore is continuing to ulcerate, and specific virus exists in it, it may be the carrier of contagion to other animals. In man we find a greater receptivity to glanders than in the dog, and in many unfortunate cases the virus spreads from the point of inoculation to the entire system and destroys the wretched mortal by extensive ulcers of the face and hemorrhage, or by destruction of the lung tissue; in other cases, however, most fortunately, glanders may develop as in the dog, only in local form, not infecting the constitution and terminating in recovery, while the specific ulcer by proper treatment is turned into a simple one. In the feline species glanders is more destructive than in the dog. The point of inoculation ulcerates rapidly and the entire system becomes infected.

While a student the writer saw a lion in the service of Professor Trasbot, at Alfort, which had contracted the disease by eating glandered meat and died with the lung farcied with tubercles. A litter of kittens lapped at the blood from the lungs of a glandered horse on which an autopsy was being made, and in four days almost their entire faces, including the nasal bones, were eaten away by rapid ulceration. Tubercles were found in the lungs.

A pack of wolves in the Philadelphia Zoölogical Garden died in ten days after being fed with the meat of a glandered horse. The rabbit, Guinea pig, and mice are specially susceptible to the inoculation of glanders, and the recent discoveries in regard to this disease have made these animals most convenient witnesses and proofs of the existence of suspected cases of the glanders in other animals by the results of successful inoculations.

The sheep and the goat are both capable of developing the disease. The goat is more susceptible and frequently develops it by means of the digestive tract, from its habit of eating droppings, rags, etc., which are found in the neighborhood of the stall. The pig is considered not to be susceptible to glanders, and a large number of inoculations, together with the feeding of glandered meat to a pen of pigs at the veterinary school at Alfort, failed to give these animals the disease, but Bollinger reports that Gerlach has seen glanders in the pig nine months after inoculation. An experiment of Spinola has also produced positive results, so that we should consider it dangerous to allow a pig the use of glandered meat.

Horned cattle and barnyard fowls are absolutely exempt from attacks of glanders, whether the virus is given to them by the digestive tract or inoculated into their tissues.

The previous reference to the existence of glanders under the two forms more commonly differentiated as glanders and as farcy, and our

reference to the various conditions in which it may exist as acute, chronic, and latent, show that the disease may assume several different phases. Without losing sight for a moment of the fact that all of these varied conditions are identical in their origin and in their essence, for convenience of study we may divide glanders into three classes: *Chronic farcy*, *chronic glanders*, and *acute farcy glanders*.

The primary lesions in any form is a local point of eruption in which we have a rapid prolification of the cell elements which make up the animal tissue with formation of new connective tissue, with a crowding together of the elements until their own pressure on each other cuts off the circulation and nutrition, and death takes place in them in the form of ulceration or gangrene. Following this primary lesion we have an extension of infection by means of those tissues immediately surrounding the first infected spot, which is most suitable for the development of simple inflammatory phenomena or the specific virus. The primary symptoms are the result of inoculation developed at the point of inoculation, but at a later time the virus is carried by means of the blood vessels and lymphatic vessels to other parts of the body and becomes lodged at different places and develops in them; again, when the disease has existed in the latent form in the lungs of the animal and the virus is wakened into action from any cause, we have it carried to various parts of the body and developing in the most favorable localities. The points of development are most frequently determined by the activity of the circulation and the effects of exterior irritants. For example, if a horse which has been so slightly affected with the virus of glanders that no symptoms are visible is exposed to cold, rain, or sleet, or by the rubbing of the harness on the body and the irritation of mud in the legs, the disease is apt to develop on the exterior in the form of farcy, while a full-blooded horse which is employed at speed and has its lungs and respiratory tract gorged with blood from the extreme use of these organs will develop glanders as the local manifestation of the disease in the respiratory tract.

Chronic farcy.—In farcy the symptoms commence by formation of little nodes on the under surface of the skin, which rapidly infringe on the tissues of the skin itself. These nodes, which are known as farcy "buds" and farcy "buttons," are from the size of a bullet to the size of a walnut. They are hot, sensitive to the touch, at first elastic and afterwards become soft; the tissue is destroyed, and infringing on the substance of the skin the disease produces an ulcer, which is known as a chancre. This ulcer is irregular in shape, with ragged edges which overhang the sore; it has a gray, dirty bottom and the discharge is sometimes thin and sometimes purulent; in either case it is mixed with a viscous, sticky, yellowish material like the white of an egg in consistency, and like olive oil in appearance. The discharge is almost diagnostic; it resembles somewhat the discharge which we have in greasy heels and in certain attacks of lymphangitis, but to the expert the

specific discharge is characteristic. The discharge accumulates on the hair surrounding the ulcer and over its surface and dries, forming scabs which become thicker by successive deposits on the undersurface until they fall off, to be replaced by others of the same kind; and the excess of discharge may drop on the hairs below and form similar brownish yellow crusts. The farcy ulcers may retain their specific form for a considerable time—days or even weeks; but eventually the discharge becomes purulent in character and assumes the appearance of healthy matter. The surface of the gangrenous bottom of the ulcer is replaced by rosy granulations, the ragged edges beveled off, and the chancre is turned into a simple ulcer which rapidly heals.

The farcy buttons occur most frequently on the sides of the lips, the sides of the neck, the lower part of the shoulders, the inside of the thighs, or the outside of the legs, but may occur at any part of the body.

We have next an irritation of the lymphatic vessels in the neighborhood of the chancres. These become swollen and then indurated and appear like great ridges underneath the skin; they are hot to the touch and sensitive. The cords may remain for a considerable time and then gradually disappear, or they may ulcerate like a farcy bud itself, forming elongated, irregular, serpentine ulcers with a characteristic, dirty, gray bottom and ragged edges, and pour out a viscous oily discharge like the chancres themselves.

The essential symptoms of farcy are the above; the *button*, the *chancre*, the *cord*, and the *discharge*. We have in addition to these symptoms a certain number of accessory symptoms, which, while not diagnostic in themselves, are of great service in aiding the diagnosis in cases where the eruption takes place in small quantities, and when the ulcers are not characteristic.

Epistaxis, or bleeding from the nose without previous work or other apparent cause, is one of the frequent concomitant symptoms in glanders, and such a hemorrhage from the nostrils should always be regarded with suspicion. The animal with farcy frequently develops a cough, resembling much that which we find in heaves—a short, dry, aborted, hacking cough, with little or no discharge from the nostrils. With this we find an irregular movement of the flanks, and on auscultation of the lungs we find sibilant or at times a few mucous râles. Another common symptom is a sudden swelling of one of the hind legs; it is suddenly found swollen in the region of the cannon, the enlargement extending below to the pastern and above as high as the stifle. This swelling is hot and painful to the touch, and renders the animal stiff and lame. On pressure with the finger the swelling can be indented, but the pits so formed soon fill up again on removal of the pressure. In severe cases we may have ulceration of the skin, and serum pours out from the surface, resembling the oozing which we have after a blister or in a case of grease. This swelling is not to be confounded with the stocking in lymphatic horses, or the œdema which we have in chronic heart

or in kidney trouble, as in the last the swelling is cool and not painful and the pitting on pressure remains for some time after the latter is withdrawn. It is not to be confounded with greasy heels. In these the disease commences in the neighborhood of the pastern and gradually extends up the leg, rarely passing beyond the neighborhood of the hock. The swollen leg in glanders almost invariably swells for the entire length in a single night, or within a very short period. When greasy heels are complicated by lymphangitis we have a condition very much resembling that of farcy. The swelled leg in farcy is frequently followed by an outbreak of farcy buttons and ulcers over its surface. In the entire horse the testicles are frequently swollen, hot and sensitive to the touch, but they have no tendency to suppuration. The acute inflammation is rapidly followed by the specific induration, which corresponds to the local lesions in other parts of the body.

Chronic farcy in the ass and mule is an excessively rare condition, but sometimes occurs.

Chronic glanders.—In chronic glanders we have the same train of inflammatory phenomena, varying in appearance from those of chronic farcy only by the difference of the tissues in which they are located. In chronic glanders we have first the tubercle, which is a small node from the size of a shot to that of a small pea, which forms in the mucous membranes of the respiratory tract. This may be just inside of the wings of the nostrils or on the septum which divides the one nasal cavity from the other and be easily detected, or they may be higher in the nasal cavities on the turbinated bones, or they may form in the larynx itself, or on the surface of the trachea or deep in the lungs.

The tubercles, which are first red and hard and consist of new connective tissue, soon soften and become yellow; the yellow spots break and we have a small ulcer the size of the preceding tubercle, which has a gray, dirty bottom and ragged edges and is known as a chancre. This ulcer pours from its surface a viscous, oily discharge similar to that which we have seen in the farcy ulcer. The irritation of the discharge may ulcerate the lining mucous membrane of the nose, causing serpentine gutters with bottoms resembling those of the chancres themselves. If the tubercles have formed in large numbers we may have them causing an acute inflammation of the Schneiderian membrane, with a catarrhal discharge which may mark the specific discharge, or that which comes from the ulcers and resembles the discharge of strangles or simple inflammatory diseases.

The eruption of the ulcers and discharge soon cause an irritation of the neighboring lymphatics; and in the intermaxillary space, deep inside of the jaws, we find an enlargement of the glands, which for the first few days may seem soft and œdematous, but which rapidly becomes confined to the glands, these being from the size of an almond to that of a small bunch of berries, exceedingly hard and nodulated. This enlargement of the glands is found high up on the inside of the jaws, firmly

adherent to the base of the tongue. It is not to be confounded with the swelling, puffy, œdematous, and not to be separated from the skin and subcutaneous connective tissues, which we find in strangles, in laryngitis, and in other simple inflammatory troubles.

These glands bear a great resemblance to the hard, indurated glands which we find in connection with the collection of pus in the sinuses; but in the latter disease the glands have not the nodulated feel which they have in glanders. With the glands we find indurated cords, feeling like balls of tangled wire or twine, fastening the glands together. The essential symptoms of glanders are the *tubercle*, the *chancre*, the *glands*, and the *discharge*. With the development of the tubercles on the respiratory tract, according to their number and the amount of eruption which they cause, we may have a cough which resembles that of a coryza, a laryngitis, a bronchitis, or a broncho-pneumonia, according to the location of the lesions. In chronic glanders we have the same accessory symptoms which we have in chronic farcy, the hemorrhage of the nose, the swelling of the legs, the chronic cough, and in the entire horse the swelling of the testicles.

On healing, the chancres on the mucous membranes leave small, whitish, star-shaped scars, hard and indurated to the touch, and which remain for almost an indefinite time. The chancres heal and the other local symptoms disappear, with the exception of the enlargement of the glands, and we find these so diminished in size that they are scarcely perceptible on examination. During the subacute attacks, with a minimum quantity of local troubles, in chronic glanders and in chronic farcy the animal rarely shows any amount of fever, but does have a general depraved appearance; it loses flesh and becomes hide bound; the skin becomes dry and the hairs stand on end. There is a cachexia, however, which resembles greatly that of any chronic, organic trouble, but is not diagnostic, although it has in it certain appearances and conditions which often render the animal suspicious to the eye of the expert veterinarian, while without the presence of local lesions he would be unable to state on what he has based his opinion.

Acute glanders.—In the acute form of glanders we have the symptoms which we have just studied in chronic farcy and in chronic glanders in a more acute and aggravated form. We have a rapid outbreak of tubercles in the respiratory tract which rapidly degenerate into chancres and pour out a considerable discharge from the nostrils. We have a cough of more or less severity according to the amount and site of the local eruption. We have over the surface of the body swellings which are rapidly followed by farcy buttons, which break into ulcers; we have the indurated cords and enlargement of the lymphatics.

Bleeding from the nose, sudden swelling of one of the hind legs, and the swelling of the testicles are apt to precede an acute eruption of glanders. As the symptoms become more marked the animal has difficulty of respiration, the flanks heave, the respiration becomes rapid,

the pulse becomes quickened, and the temperature becomes elevated to 103°, 104°, or 105° F.

With the other symptoms of an acute fever the general appearance and station of the animal is that of one suffering from an acute pneumonia, but upon examination, while we may find sibilant and mucous râles over the side of the chest, and may possibly hear tubular murmurs at the base of the neck over the trachea, we fail to find the tubular murmur or the large area of dullness on percussion over the sides of the chest which belongs to simple pneumonia.

The *post-mortem* examination of the lungs shows that the pneumonia of glanders is a lobular, V-shaped pneumonia scattered through the lungs and caused by the specific inflammatory process taking place at the divergence of the smaller air tubes of the lungs. In some cases of acute glanders the formation of tubercles may so irritate the mucous membrane of the respiratory tract and cause such a profuse discharge of muco-purulent, or purulent matter that the specific character of the original discharge is entirely masked. In this case, too, the submaxillary space may for a few days so swell as to resemble the œdematous inflamed glands of strangles, equine variola, or laryngitis. This condition is especially apt to be marked in an acute outbreak of glanders in a drove of mules.

Cases of chronic farcy and glanders, if not destroyed, may live in a depraved condition until the animal dies from general emaciation and anæmia, but in the majority of cases, from some sudden exposure to cold, it develops an acute pneumonia or other simple inflammatory trouble which starts up the latent disease and the animal has acute glanders.

In the ass, mule, and plethoric horses, acute glanders usually terminates by lobular pneumonia. In other cases the general symptoms may subside. The symptoms of pneumonia gradually disappear, the temperature lowers, the pulse becomes slower, the ulcers heal, leaving small indurated cicatrices, and the animal may return to apparent health, or may at least be able to do a small amount of work with but a few symptoms of the disease remaining in a chronic form. During the attack of acute glanders the inflammation of the nasal cavities frequently spreads into the sinuses or air cells, which are found in the forehead and in front of the eyes on either side of the face, and cause abscesses of these cavities, which may remain as the only visible symptom of the disease. An animal which has recovered from a case of acute glanders, like the animals which are affected by chronic glanders and chronic farcy, are apt to be affected with emphysema of the lungs or the heaves, and to have a chronic cough. In this condition they may continue for a long period, serving as dangerous sources of contagion, the more so because the slight amount of discharge does not serve as a warning to the owner or driver as profuse discharge does in the more acute cases.

With good care, good food, and good surroundings and little work, an animal affected with glanders may live for months or even years in an apparent state of perfect health, but with the first deprivation of food, with a few days of severe hard work, with exposure to cold or with the attack of a simple fever or inflammatory trouble from other causes, the latent seeds of the disease break out and develop the trouble again in an acute form.

At the post-mortem examination of an animal which has been destroyed or has died of glanders we find evidences of the various lesions which we have studied in the symptoms. In addition to this, we find tubercles similar to those which we have seen on the exterior throughout the various organs of the body. Tubercles may be found in the liver, in the spleen, and in the kidneys. We may have inflammation of the periosteum of the bones, and we have excessive alterations in the marrow in the interior of the bones themselves. Both of these conditions during the life of the animal may have been the cause of the lamenesses which were difficult to diagnose.

In one case which came under the observation of the writer, a lame horse was destroyed and found to have a large abscess of the bone of the arm, with old tubercles of the lungs. When an animal has died immediately after an attack of a primary acute case of glanders, we find small V-shaped spots of acute pneumonia in the lungs. If the animal has made an apparent recovery from acute glanders, and in cases of chronic farcy and chronic glanders no matter how few the external and visible symptoms may have been, there is a deposit of tubercles—small, hard, indurated nodes of new connective tissue to be found in the lungs. When these have existed for some time we may find a deposit of lime salts in them. These indurated tubercles retain the virus and their power to give out contagion for almost an indefinite time, and predispose to the causes which we have studied as the common factors in developing a chronic case into an acute case; that is, an inflammatory process wakens up their vitality and produces a reinfection of the entire animal. The blood of an animal suffering from chronic glanders and farcy is not virulent and is unaltered, but during the attack of acute glanders, while the animal has fever, the blood becomes virulent and remains so for a few days.

Treatment.—Fully the entire list of drugs in the pharmacopœia have been tested in the treatment of glanders. Good hygienic surroundings, good food, with alteratives and tonics, frequently ameliorate the symptoms and often do so to such an extent that the animal would pass the examination of any expert as a perfectly sound animal. But while in this case the number of tubercles of the lungs, which are invariably there, may be so few as not so cause sufficient disturbance in the respiration as to attract the attention of the examiner, they exist, and will remain there almost indefinitely with the constant possibility of a return of acute symptoms.

In several celebrated cases horses which have been affected with glanders have been known to work for years and die from other causes without ever having had the return of symptoms; but, allowing that these cases may occur, they are so few and far between, and the danger of infection of glanders to other horses and to the stable attendants is so great, that no animal which has once been affected with the disease should be allowed to live.

In all civilized countries, with the exception of some of the States in the United States, the laws are most stringent regarding the prompt declaration on the part of the owner and attending veterinarian at the first suspicion of a case of glanders, and they allow a liberal indemnity for the animal. When this is done, in all cases the animal is destroyed and the articles with which it has been in contact are thoroughly disinfected. When the attendants have attempted to hide the presence of the disease in a community, punishment is meted to the owner, attending veterinarian, or other responsible parties. Several States have passed excellent laws in regard to glanders, but with few exceptions these laws are not carried out with the rigidity with which they should be. In other States where an indemnity is allowed on declaration on the part of the owner, the appraisement of the animal is not fairly made. If the owners of infected animals are to be encouraged to declare the presence of the disease in order to protect their neighbors from the danger of contagion they should be paid, not what the animal affected with the disease is considered worth, when it is valueless, but the one-half or two-thirds of what would be its market value without the disease, and the community should share the loss which the owner should make in order to protect others.

RABIES IN THE HORSE.

SYNONYMS: Hydrophobia, madness, lyssa, rage, *Wuthkrankheit.*

Rabies is a contagious disease, which is usually transmitted by a bite and by the introduction of a virus contained in the saliva of an affected animal, but may be transmitted in other ways. It is characterized by symptoms of aberration of the nervous system, and invariably terminates fatally. It is a disease essentially of the dog, but is transmitted to the horse, either from dogs or from any other animal affected with it.

As a disease of the horse it is useless to enter into the etiology further than to assume that in this animal it is invariably the result of the bite of a rabid animal, usually a dog.

Perhaps no disease in medicine has been the object of more controversy than rabies. Certain medical men of prominence have even doubted the existence of the disease. Many medical men have claimed for it a spontaneous origin. The experience, however, of ages has shown that contagion can be proved in the great majority of cases, and by analogy with other contagious diseases, we may only believe that the development of one case requires the preëxistence of a previous

case from which the virus has been transmitted. M. Pasteur has further added to our knowledge of the disease by showing that a virus capable of cultivation exists in the nervous system, especially in the lower part of the brain (medulla oblongata), and in the anterior part of the spinal column. M. Pasteur has further shown that that portion of the nervous system which contains the virus, the exact nature of which has not yet been demonstrated, will retain it for an indefinite time if kept at a very low temperature, or if left surrounded by carbonic acid; but if the nerve matter, which is virulent at first, is exposed to the air and by substances which will absorb the surrounding moisture is kept from putrefaction, it will gradually lose its virulence and become inoffensive in about fifteen days. He has further shown that the action of a weak virus on an animal will prevent the development of a stronger virus, and from this he has formulated his method of prophylactic treatment. This treatment consists of the successive inoculation of portions of the nerve matter, containing the virus from a rabid animal, which has been exposed to the atmosphere for thirteen days, ten days, seven days, and four days, until the virulent matter which will produce rabies in any unprotected animal can be inoculated with impunity. A curious result of the experiments of M. Pasteur is that an animal which has first been inoculated with a virus of full strength can be protected by subsequent inoculations of attenuated virus repeated in doses of increasing strength.

In the horse rabies is invariably the result of the bite of a rabid dog or other rabid animal. From the moment of inoculation a variable time elapses before the development of any symptoms. This time may be eight days, or it may be several months; it is usually about four weeks. The first symptom is an irritation of the original wound. This wound, which may have healed completely, commences to itch until the horse rubs or bites it into a new sore. The horse then becomes irritable and vicious. It is especially susceptible to surrounding media; excessive light, noises, the entrance of an attendant, or any other disturbance will cause the patient to be on the defensive. It apparently sees imaginary objects; the slightest noise is exaggerated into threatening violence; the approach of an attendant or another animal, especially a dog, is interpreted as an assault and the horse will strike and bite. The violence on the part of the rabid horse is not for a moment to be confounded with the fury of the same animal suffering from meningitis or any other trouble of the brain. In rabies there is a volition, a premeditated method, in the attacks which the animal will make, which is not found in the other diseases. Between the attacks of fury the animal may become calm for a variable period. The writer attended a case in which, after a violent attack of an hour, the horse was sufficiently calm to be walked 10 miles and only developed violence again an hour after being placed in the new stable. In the period of fury the horse will bite at the reopened original wound; it will rear and attempt to break

its halter and fastenings; it will bite at the woodwork and surrounding objects in the stable. If the animal lives long enough it shows paralytic symptoms and falls to the ground, unable to use two or more of its extremities, but in the majority of cases, in its excesses of violence, it does physical injury to itself. It breaks the jaws in biting at the manger, or fractures other bones in throwing itself on the ground, and dies of hemorrhage or internal injuries. At times throughout the course of the disease there is an excessive sensibility of the skin, which, if irritated by the touch, will bring on attacks of violence. The animal may have appetite and desire water throughout the course of the disease, but on attempting to swallow has a spasm of the throat, which renders the act impossible. This latter condition, which is common in all rabid animals, has given the disease the name of *hydrophobia* (fear of water).

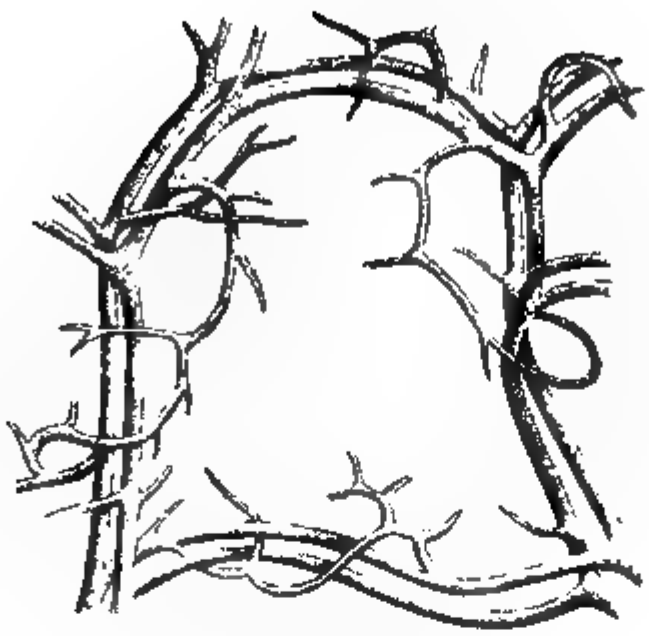
In a case recently under the care of the writer a horse, four weeks after being bitten on the forearm by a rabid dog, developed local irritation in the healed wound and tore it with its teeth into a large ulcer. This was healed by local treatment in ten days and the horse was kept under surveillance for over a month. On the advice of another practitioner the horse was taken home and put to work, and within three days it developed violent symptoms and had to be destroyed.

The diagnosis of rabies in the horse is to be made from the various brain troubles to which the animal is subject; first, by the history of a previous bite of a rabid animal or inoculation by other means; secondly, by the evident volition and consciousness on the part of the animal in its attacks, offensive and defensive, on persons, animals, or other disturbing surroundings. The irritation and reopening of the original wound or point of inoculation is a valuable factor in diagnosis.

Recovery from rabies may be considered as a question of the correctness of the original diagnosis.

No remedial treatment has ever been successful. All of the anodynes and anæsthetics, opium, belladonna, bromide of potash, ether, chloroform, etc., have been used without avail. The prophylactic treatment of successive inoculations is being used on human beings, and has experimentally proved efficacious in dogs, but would be impracticable in the horse, which must invariably be destroyed or be so guarded as to protect the surrounding attendants and other animals in the same stable, when it will die in a day or two from self-inflicted traumatism or paralysis.

1



1 - Uninflamed wing of the bat.

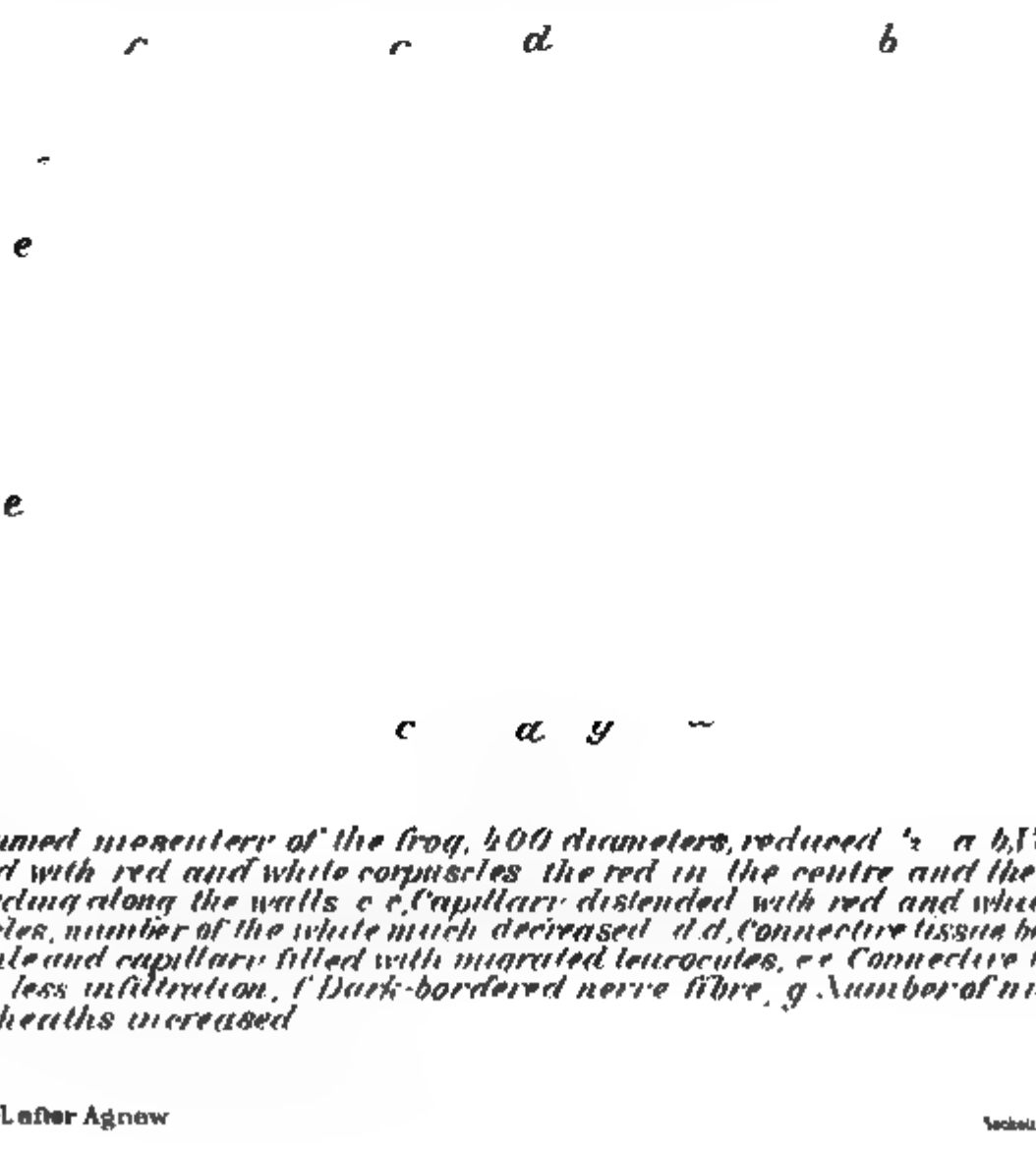
2

2 - Inflamed wing of the bat

Haines, after Agnew. Sachse & Wilhelms Lith. Co. N.Y.

INFLAMMATION.

1. *Non inflamed mesentery of the frog 400 diameters reduced ½. a a Venule with red and white corpuscles. b b Gelatinous nerve fibre. c Capillary. d, d, Dark bordered nerve fibre. e e Connective tissue with connective tissue corpuscles and leucocytes scattered sparsely through it*



2 *Inflamed mesentery of the frog, 400 diameters, reduced ½. a b Venule filled with red and white corpuscles the red in the centre and the white crowding along the walls. c c Capillary distended with red and white corpuscles, number of the white much decreased. d d Connective tissue between venule and capillary filled with migrated leucocules. e e Connective tissue with less infiltration. f Dark-bordered nerve fibre. g Number of nuclei in sheaths increased*

Haines, del. after Agnew

Jackson & Wilderhue Litho Co. NY

INFLAMMATION.

Barnes del.

GLANDERS.

Nasal septum of horse right side, showing acute lesions

Haines del

GLANDERS.

Nasal septum of horse, right side showing acute lesions

GLANDERS

Middle region of nasal septum, left side showing ulcers

SHOEING.

By WILLIAM DICKSON,

Veterinarian to the State Farmers' Institute of Minnesota.

Although the subject discussed in the present chapter may not, strictly speaking, be entitled to a place in a category of the ailments to which horseflesh is heir, bad and indifferent shoeing are such prolific sources of both disability and disease in the noblest of all our dumb animals, that no excuse is necessary in claiming for it equal attention at the hands of those interested.

It has sometimes been asserted that the history of every horse is a record of human endeavor to mar his utility. While the accuracy of such a sweeping assertion may fairly be called in question, there are undoubtedly respects in which the horse in domestication is very often the victim of his owner's ignorance, indifference, or even mistaken kindness, and in no particular is this more strikingly conspicuous than in the ordinary treatment of organs so vitally essential to his usefulness as his feet. No horseman questions the truth of the aphorism "no foot, no horse," and yet in no portion of that animal's economy has he suffered so many wrongs, or as a natural consequence endured so much uncalled-for suffering, as in his feet, and to shoeing a very large proportion of these evils is, beyond all doubt, directly or indirectly referable.

Unfortunately, under certain conditions, shoeing is an almost unavoidable consequence of the horse's domestication, and, although we may have no wish to uphold the traditional methods, we are driven to the conclusion that an artificial protection of some kind for the horse's foot is very frequently one of the penalties which civilization inexorably exacts. That the ordinary iron shoe is the best and least hurtful means that could be devised, I am reluctant to admit; but, so far, even American ingenuity has failed to develop anything better suited to the purpose. That the system of horseshoeing as it obtains, even in the most skillful hands, is pregnant with mischief to the foot, no one who is conversant with the facts will venture to deny. As a matter of physiological fitness the shoe and its mode of attachment are utterly indefensible. Each time a horse is shod—every nail driven—means so much injury to the foot. The better the job the less that injury is; but there is no

such thing as absolute immunity from an evil which must always exist in inverse ratio to the skill displayed in the execution of the work. We have, however, to deal with facts as we find them, and if we have, day after day, to impose upon our horses work of a nature which entails upon their feet more waste of horn than nature can replace during the ordinary interval of rest, we are obliged to adopt a defense of some kind. It would be futile to inveigh against the form of protection in universal use, unless we were prepared with a substitute not open to the same or equally serious objections.

There is, however, at least one very large and important class of horses to which shoes are by no means an habitual necessity, namely, our agricultural horses. The nature of their work, the pace at which they are required to perform it, and the character of the ground over which they ordinarily move, all unite to render artificial protection for their feet, save under exceptional circumstances, altogether uncalled for. When this is so, and when it is conceded that shoeing is, even under the most favorable circumstances, an evil (albeit in some cases a necessary one), a frequent cause of disease, and therefore a direct source of loss, it is a matter of deep regret that such a large majority of our farm horses, the very mainspring of our agricultural existence, should be needlessly subjected to a mutilation which curtails the period of their natural efficiency and too often renders their life thus shortened one long-continued agony. For it must be borne in mind that our ordinary village blacksmith, of whose daily work horseshoeing forms but an insignificant and by no means either an easy or pleasant part, is not always the most competent of workmen.

Without wishing to do injustice to our rural knights of the anvil, it is nevertheless a lamentable truth that these votaries of the buttress and drawing-knife are, all the world over, so wedded to a number of traditionary practices, so heinous, so irrational, so prejudicial to the interests alike of the horse and his owner, that one might well be excused for wondering whether their mission were not to mar instead of to protect the marvelously perfect handiwork of the Creator. Ignorant alike of the anatomy, physiology, and economic relations of the parts, they mutilate, they cut and carve as whim, prejudice, or time-honored custom dictates. Disaster, it may be slowly, but surely, follows, and all too often the poor dumb creature's suffering foots the bill. Let us glance in passing at some of these traditional practices.

Foremost among them is the insane habit of trimming the frog and thinning out the sole till it visibly yield to the pressure of the operator's thumbs. The frog is nature's cushion and hoof-expander, placed there by an all-wise hand; by its elasticity it wards off concussion from the less elastic portions of the structure, and by its resilience assists in maintaining the natural expansion of its horny ambit; that is to say, it does so in its natural state, but the drawing-knife's touch is fatal to it. Once cut and carved and deprived of pressure, those very acts

cause it to shrink, dry, and harden, and at once lose those very attributes which constitute its usefulness to the foot. Robbed of its elasticity and resilience, it is incapable of discharging its allotted functions—both as a cushion and as an expander it is a dead failure; indeed it is worse, as in its altered character it is now a menace instead of a protection, a bane rather than a boon to the foot that wears it.

The destruction of this important factor having been thus provided for, the operator probably next turns his attention to the sole, which, by all traditions of the craft, must be pared down until only a thin film of soft, partially formed horn is left to protect the living structures within against injury from the substances with which the foot necessarily comes in contact. Nor does the mischief stop here. The sole itself, or what is left of it, consists now of soft, moist, half-formed horn, which dries and shrinks on exposure to the air, and thereby entails a further and a still more serious injury on the foot.

We have seen in the preceding chapters how the sole is secreted by the velvety tissue dependant from the membrane which invests the pedal bone, the minute, hollow, fibrous processes of which penetrate it and minister to its support. In the mutilated, shrunken sole these delicate fibers are pinched in the lessened caliber of the pores; the source of supply is cut off, and the process of repair retarded if not absolutely arrested. There seems to be a fascination about this work of destruction, and the incompetent workman next addresses himself to the self-imposed task of improving upon nature by removing the bars and what he calls, on the *lucus a non lucendo* principle, "opening" the heels, a process which, in plain language, means opening a road for them to close over. On this poor, maimed foot a shoe, often many sizes too small, is tacked, and the rasp is most likely called into requisition to reduce the foot to fit the shoe; for although it is apparently of little moment whether the shoe fits the foot, it is indispensably necessary that the foot should, somehow or other, be got to fit the shoe, and horseshoeing, like other arts, must needs sacrifice on the altar of appearances. It is sad that art and nature should so often be at variance, and that what satisfies the one should outrage the demands of the other.

The foot is now shod and protected from undue wear, to be sure, but at what a sacrifice! Robbed of its cushion, its natural expander; its lateral braces removed; its sole mangled and its natural repair arrested; the hairlike fibers which make up the horny wall crushed, deflected, and their nutritive function impeded by an unnecessary number of nails; robbed by the rasp of its cortical layer of natural varnish, which retains the moisture secreted by the economy, the strong walls become desiccated and weakened, and the foot is in a very sorry plight indeed. To some this picture may seem overdrawn, but it is nevertheless a matter of daily occurrence.

Of course, even among agricultural horses, there are individuals which

can not work unshod; but these are exceptional cases. Then, again, in winter, when the usual snowfall is wanting, most horses' feet will require protection; but nowadays an owner has himself to blame if he submits to having the work done in that wrong-headed and ridiculous manner, which has called into existence such a long and dismal category of disease and misery.

The horse's foot is, after all, a good deal of what we make it, and if our horses, from their colthood up, had their feet more carefully attended to, and especially were they invariably to stand while in confinement on some material less deleterious to the hoof than dry wooden flooring, from which the foot suffers no attrition whatsoever, and by which it is moreover depleted of its natural moisture, their feet would, in the period of the animals' active usefulness, be found to be better shaped, harder, less brittle, and in every way better suited for the work required of them.

In the East Indies, where pony racing is very popular and the purses exceedingly valuable, many expedients are resorted to to smuggle a pony that is over height under the 13.2 standard (the maximum height for ponies) among them, of course cutting down the feet as far as can be done with impunity. I frequently observed that those of the handsome little Arabs and Walers (Australians), which came up oftenest for measurement, and whose feet were in consequence most frequently pared down (albeit by an artist at the business, as these little animals were too valuable for their owners to accept any risk of injury) were those whose feet subsequently stood best the trying ordeal of training and racing on the adamantine going of the tropics. The moral of this is obvious. It might even be possible (I do not mean necessarily in this particular way) in the course of generations to develop a horse whose feet should be so improved that he could do all sorts of work on all sorts of going barefoot with impunity; but this would imply an amount of self-sacrifice in the present for the benefit of remote prosperity which is hardly to be looked for in this practical age, and the contention of enthusiasts that all horses could and should, under all circumstances, go unshod is, I fear, utopian and impractical.

I have endeavored to show that shoeing, as generally, or at all events very frequently, practiced is a fruitful source of injury to our horses' feet; but as we can not altogether dispense with the custom, let us turn to a consideration of the means which lie in our power of minimizing the attendant evil as much as possible.

There is one instrument which I should like to see, if possible, omitted from the shoeing outfit of every farrier, and that is the drawing-knife. If our blacksmiths would use their knives less and their heads more in the execution of their very important and by no means easy duty, our horses would be the better for it, and so would their owners. There is no great mystery surrounding the subject, and the application of ordinary common sense, in lieu of the barbarous routine which has been so

long handed down from generation to generation until it has actually become a portion of the blacksmith's creed, would go a long way towards obviating many, if not most, of the cruel wrongs to which our horses' feet are day by day needlessly subjected.

The outside, or horny wall, and that portion of the sole which is in immediate contact with it, on which the shoe should rest, are the only portions of the foot which require to be interfered with in preparing the foot for the shoe, and all the trimming that is necessary can and ought to be effected by means of the rasp. The frog and sole should on no pretext whatever be meddled with, save to the extent I have indicated. Their presence in their entirety, and in their natural state, is essentially necessary to the well-being of the foot, and neither brooks the touch of the steel.

There may be differences of opinion among authorities as to minor details in shoeing, but there is at all events one issue on which it is satisfactory to know that there is absolute unanimity; one practice which all alike utterly condemn; and that is the irrational treatment of the frog and sole, to which I have already alluded. There is, however, no particular in which the thinking horse-owner finds himself more frequently at variance with his blacksmith, for there is no detail in all the latter's misconceived procedure to which he clings with such colossal obstinacy, which is not open to argument, and which sets common sense at defiance.

It is a strange fact, but none the less true, that all the world over the farrier is the one among all our artisans who is least amenable to suggestions from his employer. Other mechanics permit their patrons at least some discretion as to the size, shape, and structure of the article desired, but when the ordinary horse owner takes his animal to the shoeing forge he has usually to place himself absolutely in the blacksmith's hands, and give him *carte blanche* to cut and carve at his unholy will, or else take his horse elsewhere, and there probably find himself no better off. The result is that his horse's feet are mercilessly mutilated instead of being left as nearly as possible as nature in her ineffable wisdom made them.

Plate XXXXII, Fig. 1, shows the only parts which should be reduced when a foot is properly prepared for the shoe. Sufficient care is not always given to shortening the hoof so that its angle should conform exactly to the inclination of the limb. It would be misleading to lay down any arbitrary degree of obliquity. The angle differs in different cases, and the natural bias of the superimposed structures is the only safe guide to follow. More than one instrument has been devised for ascertaining the correct degree of obliquity, some of them simple and efficacious; but an inspection of the foot in profile is usually the best way of deciding. Too much importance can not possibly be attached by the workman to this and the succeeding step, namely, leveling the ground surface of the foot, as the slightest departure from absolute

exactitude here renders whatever amount of care he may devote to the completion of his work worse than useless. The very smallest deviation from the perpendicular entails disastrous consequences not only on the foot but on the entire limb. In the foot itself, when the weight is borne unevenly, the lowest parts receive an undue share; the pressure retards the growth of new horn, and the foot in consequence becomes weakened, distorted, and deformed. In the limb, deflected as it is by an uneven basis, from the ground surface to its union with the trunk, the angle of incidence of the weight is imposed unequally, and bone and tendon mutually suffer from the strain.

THE SHOE.

The shoe should be as light as the weight of the animal and the nature of the work he is expected to perform will admit of. I am not now writing for the trotting horseman, who knows his own business better than I can teach him. In referring to shoeing smiths it is possible that I should have made an exception in favor of the finished artist who arms the feet of the trotter with those masterpieces of skill and ingenuity which balance his gait, level his action and perfect the rhythm of the motion with which he spurns the flying track behind him, when thousands of anxious eyes watch his every footstep, and fortunes depend on the length and tirelessness of his stride. That is a branch of the business which has received an amount of attention and achieved triumphs unrivaled or unapproached in other lands. Yet have I seen that artist (for he is nothing less), after fitting and setting a shoe, perfect in workmanship as a piece of jewelry, reach out for his tool box and rasp the foot from the coronary band to the plantar border, and thus wantonly court disaster, for what reason let him tell us if he can.

Heavy shoes not only burden the animal which is condemned to wear them, for there is truth in the old adage, "an ounce at the toe means a pound at the withers;" but they also increase the concussion inseparable from progression, and even in the trotter, whose work is meted out to him with judicious care, although the weight doubtless accomplishes the work for which it was intended, it is a draft at usury on the horse's future soundness, which that animal is bound to take up at maturity.

The legitimate mission of the shoe is to prevent undue wear of the walls, and a light shoe will do this quite as well as a heavy one; it is moreover entirely erroneous to suppose that a heavy shoe necessarily wears longer than a light one, as experience proves the contrary, in many instances, to be the case. Even among our mammoth draft horses, whose shoes must of course be made with reference to the weight they have to bear and the inordinate strain to which they are subjected when the animal which wears them is at work, I am not prepared to admit that it is by any means necessary to add to the concussion to which his feet are unavoidably subjected, by several pounds of unyielding iron

on each foot, when shoes weighing half as much would serve the purpose equally well. The lamentably short career of our city draft horse, which is usually determined by foot lameness of one kind or another, is largely attributable to the aggravated amount of battering on hard pavements which his needless weight of armament entails.

The upper surface of the shoe should be perfectly level. If the plane of the web inclines from outside inward, it greatly adds to the unavoidable tendency to contraction which shoeing invariably entails, and there is a wealth of unwisdom in most of the clumsy attempts at mechanically spreading the heels by making the inclination in the contrary direction. It is true that in cases of malformation, or grave alteration of the contour of the foot, good results are obtainable by this or other mechanical means, but all such heroic remedies should be undertaken only at the instance and under the immediate supervision of the veterinary practitioner; otherwise they are liable to do harm instead of good.

In France dilatation of the hoof by mechanical means is advocated and practiced more than elsewhere, but the operation is performed with the utmost exactitude, scrupulous care and delicacy, and under the closest professional supervision. Even under these favorable conditions the slightest accidental deviation not only defeats the object in view, but occasionally leads to untoward results. When contracted feet have to be expanded there is a far more simple, safe and at the same time effective means of attaining that end to be found within the foot itself. By lowering the walls at the heels, so as to restore frog pressure, the latter speedily recovers its lost characteristics, and in a healthy condition gradually and naturally accomplishes one of the very purposes for which the Great Architect placed it there.

It would seem to be unnecessary to say that the shoe should be so shaped as to conform exactly to the natural tread of the foot, yet a very common practice obtains of using a shoe of a uniform shape, often less in circumference, if such a term is permissible, than the foot on which it is to be nailed, and then rasping down the foot to fit it. It is obviously easier to make the foot to fit the shoe than it is to make the shoe to fit the foot; a stroke or two of the rasp effects the former, but it is a far more arduous undertaking to modify the size and shape of the shoe. The outcome of this pernicious practice is disastrous in the last degree, more especially so in a dry climate like ours, as the walls thus robbed of their natural covering permit the moisture of the foot rapidly to evaporate, and the horn fibers, which make up the outside walls, instead of being compactly knit together, readily disintegrate, and in the course of a shoeing or two those very portions in which the nails should obtain firm hold possess little more adhesion than a bundle of broom corn. If the shoe fitted as it ought to do, a touch of the rasp under each clinch would be all that was necessary, and even this much might advantageously be dispensed with. Plate XXXXIV illustrates correct and incorrect fitting, figure 1 being the right and figure 2 the wrong way.

FITTING.

In many countries what is called hot-fitting—that is to say, after the foot has been trimmed and leveled, momentarily applying the shoe at a red heat to the foot—is generally practiced to the almost entire exclusion of any other method, and the system is not only found to answer, but receives the indorsement of the most competent authorities. The climatic conditions which render the practice open to objection in this hemisphere fortunately enable us to dispense with a procedure against which there exists in the minds of many horse-owners a not unreasonable prejudice, which, however, is directed at the abuse rather than the intelligent application of a proceeding not necessarily hurtful in itself. The advantage conferred by hot-fitting consists in the fact that a more accurate accommodation is by this means more readily obtained than by any other method, and the contact between hoof and shoe can thus be made more intimate and enduring. In moist climates it is only by means of hot-fitting that a set of shoes can be got to remain on for a reasonable length of time; but in no part of this country have I found any difficulty of this nature; indeed, on the contrary, shoes are usually allowed to remain on too long, especially in the agricultural districts. It has frequently occurred to me, when in the discharge of my duties as veterinarian to the Farmers' Institute of Minnesota, I have remonstrated with some local blacksmith at the number of gigantic nails he employed in affixing a shoe, that I have been assured that did the shoe not remain on for several months his employer would be dissatisfied and would transfer his custom elsewhere. Nothing could be more short-sighted nor more unreasonable than such conduct.

The hoof of the horse is in shape a truncated cone with the base downwards; as it grows the circumference of the base consequently increases, and the shoe fitted when it was newly put on after a time becomes too small. It would be just as reasonable for a horse-owner to buy his little boy a pair of shoes which just fitted him when he was six years old, and then expect him to wear them until he was twelve, as it is for him to require his dumb servant, who can not protest against the infliction, to wear his shoes for months in succession without resetting. A badly fitting shoe is to a horse as painful as a tight boot is to his owner, and under no circumstances should shoes be permitted to remain on more than a month or five weeks at the outside; many animals require to be reshod even more frequently. It is only when an owner lets his parsimony overcome his reason that he subscribes himself to a penny-wise and pound-foolish policy, which can only result, as such policies invariably do, in a loss to their exponent.

NAILS.

The fewest nails, and these of the smallest size, that will ensure the shoe remaining on for the proper length of time, is a rule that should never

be departed from. The nail holes should not be punched too fine—that is, too near the outside edge of the web of the shoe (this is a very common failing of "keg shoes"); if punched coarser the nails will take a thicker and lower hold of the walls, and in this way obviate their having to be driven so high up as to approach dangerously near the sensitive structures. Two of the commonest errors in shoeing are using too many nails and these of an altogether unnecessary size, and then driving them too high up into the walls. If a perfectly level bearing has been obtained—as ought to be the case—it is astonishing how few and how small nails will hold the shoe firmly in its place; but let the fitting be carelessly done, then, no matter how the shoe may be nailed on, but a short time elapses ere the clinches open and the shoe works loose. When we bear in mind that the wall of the hoof consists of a number of hair-like tubes cemented together, and that each tube is one of an infinite number of minute canals, which diffuse throughout the horn a fluid that nourishes and preserves it, it will be readily understood that each nail driven into the wall deflects those little tubules, probably absolutely closing those with which it comes into actual contact and hurtfully compressing those lying half way between the nails, thus impairing if not destroying their utility and cutting off the supply of a material necessary to the foot's existence. If we could dispense with nails altogether our horses' feet would be immeasurably better off. This, unfortunately we apparently can not do, but we have it in our power to minimize an evil which, at present, at all events, we can not entirely avoid. There has recently been patented in England a nailless horseshoe, for which the patentees claim extraordinary excellence. I have not yet been able to see one of these shoes, but if they will enable us to dispense with the use of nails they will confer a priceless boon on horseflesh generally. From the description given by the patentees I fail to see, however, how the shoes can be kept sufficiently firmly in place, nor can I glean from the same source, that the new method of attachment (by means of a metal band and studs) is equally efficacious with the old, or less injurious.

There is, however, one shoe, without some allusion to which any essay of this kind would be incomplete, namely, the "Charlier shoe," invented some years ago by M. Charlier, a well-known veterinary surgeon of Paris, France, which has never, in my opinion, received either the attention or trial its merits deserve. Common sense and science alike indorse it, and were the system to become more generally known in this country I venture to assert that there is an extremely large number of cases in which it would be found both appropriate and beneficial. For this reason I will briefly describe it. The shoes used are about one-third the weight of an ordinary shoe, and less than one-half the width. In preparing the foot for the shoe and sole, frog and bars are left, as they ought to be, absolutely untouched, and a groove is cut, by means of a knife specially designed for the purpose, in the wall, not high enough to reach above the sole level, and less than the thickness

of the wall in depth. Into this groove a narrow but thick band of iron is sunk and nailed to the foot by means of four to six conical-headed nails, the heads being countersunk in the shoe. The advantage of this method of shoeing is that the frog, bars, and a portion of the sole come to the ground exactly as if the foot were unshod, and one and all participate in weight-bearing as it was obviously intended they should, while the wall is protected from wear by the small rim of iron let into its ground surface.

A modification of the system has been suggested by an enthusiast who writes under the name of "Free Lance," which possesses even superior advantages. Under this system only tips or toe-pieces of the Charlier pattern are used, the foot being prepared for their reception, as shown in Plate XXXXIV, Fig. 3. The tips are made with their ground surface broader than their upper face, and the outside edge of the web, beveled off so as to follow the angle of the profiles of the foot. Plate XXXXIV, Fig. 4.

I have used both the Charlier shoe and the tip in this country as well as in the East Indies, and I am perfectly satisfied that in many respects they are superior to any other model. They are infinitely lighter, the nails are smaller and fewer in number; all steps in the right direction; but the dominant superiority of the device consists in the fact that the frog obtains pressure to the extent contemplated by nature, and in the case of the Charlier tip particularly the exercise of its double function as a buffer and dilator is absolutely untrammeled in anyway by the shoe.

FINISHING TOUCHES.

When the shoe has been fitted, the nails driven, drawn up, and clinched, there should be nothing left to be done. Very frequently, however, it is just at this stage that the incompetent workman, in the most uncalled for manner, inflicts serious and lasting injury on the foot. If the wall has not been sufficiently reduced in leveling the foot, or if the shoe used is too small, the rasp is required to reduce the projecting parts. (Plate XXXXIV, Fig. 2.) Often, indeed, when there is not even this pretext, the whole surface of the foot is subjected to its relentless touch. No procedure could well be devised which would be more hurtful to the foot. In its natural state the entire hoof, from the coronet to the sole level, is covered by a fine coating of natural varnish, thickest at the upper margin and gradually becoming thinner as it descends. Under cover of this beneficent curtain the new horn is secreted and protected until it has attained maturity. The moisture secreted by the animal economy, necessary to the perfection of the horn, is retained within it, and the prejudicial influences of alternating drought and moisture are set at defiance. In a very dry atmosphere like ours it is of paramount importance that this beautiful shield should be preserved and fostered, and no name is bad enough for a senseless custom which, to serve no

good purpose, robs the foot of a necessary protection which it is beyond the power of art to imitate or replace.

WINTER SHOEING.

The subject of winter shoeing presents, in many sections of the country, fresh difficulties, for now the shoe is required, in the case of all classes of horses, to discharge a double duty; to afford foothold as well as guard against undue wear. Various patterns of shoes have from time to time been invented to meet this dual requirement, but the commonest of all, fashioned with shoe and heel calks or calkins, is, faulty though it be, probably, all things considered, the one which best suits the requirements of the case. It should, however, never be lost sight of that the shorter, the sharper, and the smaller the calkins are, so long as they answer the purpose which called them into existence, so much the better for the foot that wears them. High calkins, while they confer no firmer foothold, are potent means of inflicting injury both on the foot itself and the superincumbent limb at large. It is only from that portion of the catch which enters the ground surface that the horse derives any benefit in the shape of foothold, and it must be apparent to the meanest capacity that long calkins, which do not penetrate the hard, uneven ground, are so many levers put into the animal's possession to enable if not compel him to wring his feet, rack his limbs, and inflict untold tortures on himself. I have laid particular stress on this subject, as I am of opinion that the presence of navicular disease, a dire malady from which horses used for agricultural labor should enjoy a practical immunity, is traceable largely to the habitual use, during our long winter months, of needlessly large calkins, only fractional parts of which find lodgment in the earth or ice during progression. I will explain what I mean. When a horse is shod with the exaggerated calkins to which I have alluded, the toe and heel calks are, or ought to be, the same height, to start with, at all events. Very often, however, they are not, and even when they are, the toe calk wears down on animals used for draft purposes far more rapidly than its fellows at the heel. The result is that the toe is depressed while the heel is unnaturally raised. The relative position of the bony structures within the foot is altered, and the navicular bone, which is not one of the weight-bearing bones, is brought within the angle of incidence of both weight and concussion, influences which it was never contemplated it should withstand, and which its structure precludes its sustaining without injury. The bone becomes first bruised and then diseased; the tendon, to which it was intended it should act as a pulley, which passes over and is in constant contact with it, before long also becomes implicated, and what is technically known as navicular arthritis is thus engendered and developed.

SHOEING FOR A SPECIFIC PURPOSE.

Thanks to the amount of attention which every detail that could possibly tend to the more perfect development of that paragon of horse-flesh, the American trotter, has received at the hands of all classes of men, the matter of shoeing for specific purposes has made greater progress in America than in any other country on the face of the globe, and that is a department of the farrier's art which is justly entitled to the highest eulogium that can be bestowed upon it.

The different styles of shoes which have been devised are marvels of ingenuity, and many of them are admirably effective as remedial agents for faulty gaits and uneven action. Their number is infinite, but as many are applicable only, or in a large measure, to horses used solely for speed purposes, any attempt at classification or detailed description would be out of place in a work of this kind. When intelligently applied a considerable number are, however, potent auxiliaries in mitigating in some cases the results of natural defects of conformation amongst animals whose lot is cast in the humbler if more useful fields of horse enterprise. Among these are the scoop-toed or roller-motion shoe for the fore feet (Plate XXXXII, Fig. 2) and the shoe (Plate XXXXII, Fig. 3) for the hind feet, which, while they obviate "forging" or "clicking," a habit hurtful to the horse and singularly annoying to his driver, do not in anyway tend to inflict injury on the feet or limbs. The scooped or rolled toe confers a mechanical advantage, enabling the animal to get over his toes more promptly and thus remove the front foot from the stroke of the hind extremity, while the lengthening of the branches of the hind shoes, by increasing the ground surface, retards the flexion and extension of the hind limbs.

The common practice of increasing the weight of the outside web of the hind shoes, to open the action (Plate XXXXII, Fig. 4), is equally harmless and efficacious when not carried to extremes.

Plate XXXXIII, Fig. 1, is the most effective model of shoe to square and balance the gait of unmade horses, but the period of its use should be strictly limited and the weight of the toe gradually reduced as the desired gait becomes established. An ingenious shoe to prevent "dishing" or "paddling" is shown in Plate XXXXIII, Fig. 2, but I can not acknowledge so implicit confidence in its efficacy, as the vice is the result of a physical malformation, which mechanical means can go but a small way to remove or palliate.

There are many other styles of shoe, the product of American ingenuity, for which probably equal merit might be claimed, but there are others, which, while they may cure or mitigate the special defect against which they are directed, only do so at the expense of some other portion of the structure. It has many a time furnished food for thought to the writer, that, in this great commonwealth, while there are such a large number of artificers who make horse-shoeing a profession, who

offer such convincing testimony of a vast amount of careful thought and patient study of at least some of the principles of their very important profession as many of these devices afford, the bulk of such work should be permitted to fall into the hands of a set of incompetent, ignorant, and ofttimes unprincipled bunglers, who prey upon the credulity of their employers and inflict upon the most generous of all our dumb servants an amount of injury which curtails the period of his usefulness and results in his premature decadence at an age when he ought still to be in his prime. It is possible, if not probable, that in the future it may become a less invidious task to discuss this much vexed problem. In this age of marvelous ingenuity, is it visionary to hope that it is within the power of chemistry to develop some preparation which, applied to our horses' hoofs in a liquid or pultaceous form, will quickly harden into a substance closely resembling the natural horn, which will enable us to dispense altogether with the heavy, unyielding iron, and while it affords the necessary protection to the foot will permit it to retain to the full its wondrous combination of lightness, strength and elasticity, and enable it to perform its varied functions under the most exacting conditions which advanced civilization can impose, with that marvelous triuity of apparently incompatible characteristics unhampered as they left the workshop of the Creator, all acting together in perfect harmony and absolute efficiency?

In the meantime it behooves us to make the most of the means within our power. Our horses are national property. Surely, therefore, it is time that the possibility of a great national economy was recognized, and some legislation formulated which would require an established standard of attainment in a class of workmen to whose care property of such value is habitually intrusted, and upon whose proficiency, or the reverse, so much of its utility or comparative worthlessness depends, while it, at the same time, provided for some means of practical instruction which contemplated raising the science of horseshoeing above the baneful influences of ignorance and traditional routine, to that position to which its importance to us as a people justly entitles it.

1

The foot ready for the shoe, showing frog and bars as they should be left

2

Front view of scoop toe rolling motion shoe

3

Hind foot shoe to balance the action

4

Side weight shoe for hind foot

Figs 2,3 and 4 from Russell's Scientific Horse shoeing"

Sackett & Wilhelms Litho Co N Y

PLATE XXXXIII

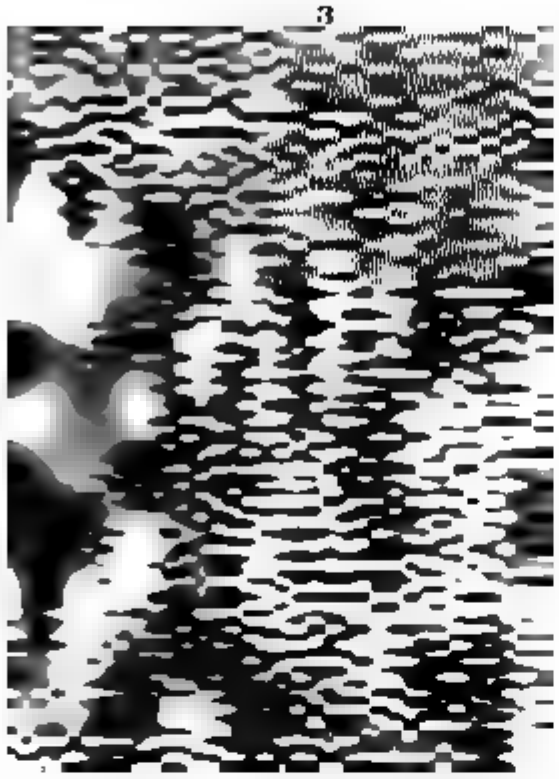
Toe weight shoe .

Non paddling shoe

from Russell's Scientific Horse shoeing"

Sackett & Wilhelms Litho Co NY

3



Foot prepared for Charlier tip.

4

Foot shod with Charlier tip

5

2

Foot

Right fitting

Wrong fitting

Hamon, del

Sackett & Wilhelms lith

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